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Contractors' *and* Engineers' Monthly

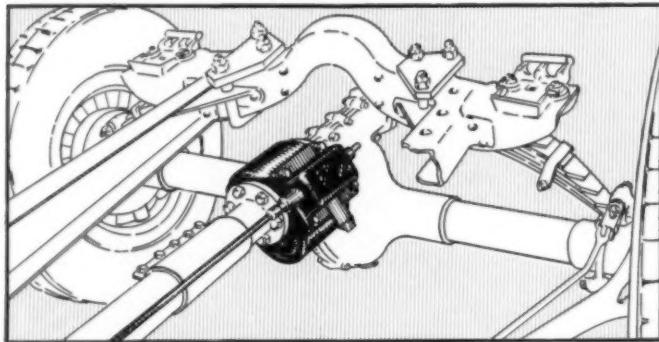
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VOL. XIV. No. 5 CONTRACTORS' & ENGINEERS' MONTHLY, May, 1927 Price, 25 Cents; \$1 a Year
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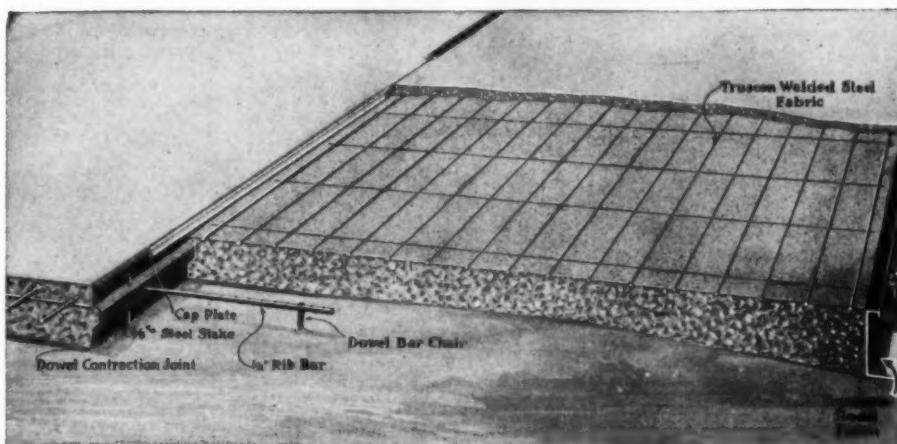
*Erie Steel Const. Co., Erie, Pa.

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 Ellicott Machy. Corp., Baltimore.
 Hayward Co., N. Y.
 Lidgerwood Mfg. Co., N. Y.
 Marion Steam Shovel Co., Marion, O.
 Stockton Iron Wks., Stockton, Cal.
 Superior Iron Wks., Superior, Wis.
- DREDGES, HYDRAULIC**
 Bucyrus Co., South Milwaukee, Wis.
 Ellicott Mach. Corp., Baltimore.
 Marion Steam Shovel Co., Marion, O.
 Morris Mach. Wks., Baldwinsville, N.Y.
- DREDGING MACHINERY**
 *S. Flory Mfg. Co., Bangor, Pa.
 Lidgerwood Mfg. Co., N. Y.
 Street Bros. Mach. Wks., Chattanooga.
- DREDGING PUMPS AND ACCESSORIES**
 Eric Pump & Engine Wks., Medina, N.Y.
 Ingersoll-Rand Co., N. Y.

If you find any errors or omissions in this Where to Purchase list, please send corrections to
 CONTRACTORS' & ENGINEERS' MONTHLY

This makes the difference

The Lakewood Worm Speed Reduction is a bronze worm gear driven by a heat-treated Steel Worm—all enclosed and running in oil. It reduces the crank-shaft speed of the power plant to the proper speed for the drum driving pinion.

There's longer life in Lakewood Concrete Mixers because with the Worm Speed Reduction the usual spur gears, shafts, and bearings are eliminated and all high-speed parts are running in oil.

Lakewood Mixers cost no more.

2nd EXPORT OFFICE: 30 CHURCH ST., NEW YORK CITY — CABLE ADDRESS: BRODITES
LAKWOOD ENGINEERING CO.
 CLEVELAND, OHIO

THE LAKWOOD ENGR. CO., Cleveland, O.
 M

Please send bulletins describing Lakewood Mixers with the Worm Speed Reduction.
 Name: _____
 Address: _____

Where to Purchase

DRILL STEEL SHARPENERS (See Sharpeners)

DRILLS, CORB

*McKiernan-Terry Drill Co., N. Y.
•Sullivan Machy. Co., Chicago.
Ingersoll-Rand Co., N. Y.

DRILLS, ROCK

Dallett Co., Philadelphia.
•Denver Rock Drill Mfg. Co., Denver.
Hardsocg Wonder Drill Co., Ottumwa, Ia.
•McKiernan-Terry Drill Co., N. Y.
•Sullivan Machy. Co., Chicago.
Chicago Pneum. Tool Co., N. Y.
Cleveland Pneum. Tool Co., Cleveland.
Cleveland Rock Drill Co., Cleveland.
Gilman Mfg. Co., E. Boston.
Helwig Mfg. Co., St. Paul, Minn.
Independent Pneum. Tool Co., Chicago.
Ingersoll-Rand Co., N. Y.
W. H. Keller, Inc., Grand Haven, Mich.
Wood Drill Wks., Paterson, N. J.

DRILLS FOR WELLS AND BLAST HOLES (See Well Drilling Machy.)

DRUMS, HOLDING

*Blaw-Knox Co., Pittsburgh, Pa.
•Clyde Ir. Wks. Sales Co., Duluth, Minn.
•Dobie Fdry. & Mach. Co., Niagara Falls.
Hayward Co., N. Y.
Monighan Machine Co., Chicago.
Street Bros. Mach. Wks., Chattanooga.

DRYERS, ASPHALT AND CEMENT

Allis-Chalmers Mfg. Co., Milwaukee.
Amer. Blower Co., Detroit, Mich.
Amer. Process Co., N. Y.
Atlas Dryer Co., Cleveland, O.
C. O. Bartlett & Snow Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
Mosher Mfg. Co., Chicago.
Ruggles-Coles Eng. Co., N. Y.

DRYERS, SAND AND GRAVEL

*Aeroil Burner Co., Union Hill, N. J.
•Jos. Honhorst Co., Cincinnati, O.
•Littleford Bros., Cincinnati, O.
•Alex. Milburn Co., Baltimore, Md.
C. O. Bartlett & Snow Co., Cleveland, O.
Chase & Lyman, Boston.
Chausse Oil Burner Co., Elkhart, Ind.
Mosher Mfg. Co., Chicago.

DUMP BODIES FOR CONCRETE

*Easton Car & Const'n. Co., Easton, Pa.
Lee Trailer & Body Co., Plymouth, Ind.

DUMP BODIES FOR MOTOR TRUCKS

*Anthony Co., Streator, Ill.
•Easton Car & Const'n. Co., Easton, Pa.
•Heil Co., Milwaukee.
Highway trailer Co., Edgerton, Wis.
•Inaley Mfg. Co., Indianapolis, Ind.
•Littleford Bros., Cincinnati, O.
•Mack Trucks, Inc., N. Y.
•Marion Steel Body Co., Marion, O.
•Wood Hydr. Hoist & Body Co., Detroit.
Amer. Prod. & Trad. Co., Chicago.
Am. Truck & Body Co., Martinsville, Va.
Archer Iron Wks., Chicago.
Atia Corp., New York.
Columbia Body Corp., Columbia, Pa.
Columbian St. Tank Co., Kansas City, Mo.
Detroit trailer & Mack Co., Detroit.
Detwiler Mfg. Co., Gallon, O.
Eagle Wagon Wks., Auburn, N. Y.
Gallon All Steel Body Co., Gallon, O.
Grissom-Russell Co., N. Y.
Herr Dump Car Mfg. Co., Coatesville, Pa.
Hughes-Keenan Co., Mansfield, O.
The Hug Co., Highland, Ill.
Jennings Aut. Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Plymouth, Ind.
Mandt Body Co., Keokuk, Ia.
Martin-Parry Corp., York, Pa.
N. Y. Central Ir. Wks., Hagerstown, Md.
Pechstein Iron Wks., Keokuk, Ia.
Stewart Iron Wks. Co., Cincinnati.

Superior Body Corp'n., Marion, Ind.
Van Dorn Iron Wks., Cleveland.

DUMP CARTS AND WAGONS, HORSE

*Acme Rd. Machy. Co., Frankfort, N. Y.
•Austin-Western Rd. Machy. Co., Chicago.
•Eagle Wagon Wks., Auburn, N. Y.
•Highway Trailer Co., Edgerton, Wis.
•Le Plant-Choate Mfg. Co., Cedar Rapids, Ia.

Russell Grader Mfg. Co., Minneapolis.
Acme Wagon Co., Emigville, Pa.
Austin Mfg. Co., Chicago.

Bain Wagon Co., Kenosha, Wis.

Columbia Body Corp., Columbus, Pa.

Gilbert Mfg. Co., Aberdeen, S. D.

Hagy Wagon Co., Abingdon, Va.

G. H. Holabog & Bro., Jeffersonville, Ind.

Little Red Wagon Co., Omaha, Neb.

Rex-Watson Corp., Canastota, N. Y.

Stockland Rd. Machy. Co., Minneapolis.

Streich Bros., Oshkosh, Wis.

Thornhill Wagon Co., Lynchburg, Va.

Western Wheeled Scraper Co., Aurora, Ill.

DUST LAYING (CALCIUM CHLORIDE)

*Dow Chemical Co., Midland, Mich.
•Solvay Sales Corp., N. Y.

Carbondale Calcium Co., Carbondale, Pa.

DYNAMITE (See Explosives)

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS

Louis Allis Co., Milwaukee.
Allis-Chalmers Mfg. Co., Milwaukee.
Crocker-Wheeler Co., Amherst, N. J.
Fairbanks, Morse & Co., Chicago.
General Elec. Co., Schenectady, N. Y.
Graybar Electric Co., New York.
Ideal Elec. & Mfg. Co., Mansfield, O.
Lincoln Elec. Co., Cleveland, O.
Robbins & Myers Co., Springfield, O.
Triumph Elec. Co., Cincinnati, O.
Wagner Elec. Mfg. Co., St. Louis.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS

General Elec. Co., Schenectady, N. Y.
Westinghouse Lamp Co., N. Y.

ELECTRIC LIGHTING PLANTS

*Climax Eng. Co., Clinton, Ia.
Allis-Chalmers Mfg. Co., Milwaukee.
Cushman Motor Wks., Lincoln, Neb.
Fairbanks, Morse & Co., Chicago.
General Elec. Co., Schenectady, N. Y.
Graybar Electric Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC TRANSFORMERS

Allis-Chalmers Mfg. Co., Milwaukee.
General Elec. Co., Schenectady, N. Y.
Kuhlmann Elec. Co., Bay City, Mich.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC WIRES (See Wire)

ELEVATORS, BUCKET

*Atlas Eng. Co., Milwaukee.

•Austin-Western Rd. Machy. Co., Chicago.

•Chain Belt Co., Milwaukee, Wis.

•Good Rds. Machy. Co., Kennett Sq., Pa.

•Geo. Haiss Mfg. Co., N. Y.

•Link-Belt Co., Chicago.

•Littleford Bros., Cincinnati.

•Russell Grader Mfg. Co., Minneapolis.

•Spears-Wells Machy. Co., Oakland, Cal.

Austin Mfg. Co., Chicago.

C. O. Bartlett & Snow Co., Cleveland, O.

Brown Hatg. Machy. Co., Cleveland, O.

Fairfield Eng. Co., Marion, Ohio.

Gifford-Wood Co., Hudson, N. Y.

Jeffrey Mfg. Co., Columbus, O.

Robins Conv. Belt Co., N. Y.

Univ. Rd. Machy. Co., Kingston, N. Y.

Webster Mfg. Co., Chicago.

Weiller Mfg. Co., Chicago.

Worthington Pump & Mch. Corp., N.Y.

ELEVATORS, PASSENGER, FREIGHT, ETC.

Am. Elev. & Mach. Co., Louisville, Ky.

Atlantic Elev. Co., Inc., Philadelphia.

Bay State Elev. Co., Springfield, Mass.

Haughton Elev. & Mach. Co., Toledo, O.

Kaestner & Hecht Co., Chicago.

Llewellyn Ir. Wks., Los Angeles, Cal.

Montgomery Elev. Co., Moline, Ill.

Otis Elevator Co., N. Y.

C. Ridgway & Son Co., Coatesville, Pa.

A. B. See Elec. Elev. Co., N. Y.

Speidel Elev. Corp., Reading, Pa.

Warner Elev. Mfg. Co., Cincinnati.

Warsaw Elev. Co., Warsaw, N. Y.

ENGINES, GAS AND GASOLINE

*Alamo Eng. Co., Hillsdale, Mich.

*Caterpillar Tr'tor Co., San Leandro, Cal.

*Climax Eng. Co., Clinton, Ia.

*Continental Motors Corp., Muskegon, Mich.

*Cook Motor Co., Delaware, O.

*Domestic Eng. & Pump Co., Shippensburg, Pa.

*Evinrude Motor Co., Milwaukee.

*Hercules Motors Corp., Canton, O.

*John Lauson Mfg. Co., New Holstein, Wis.

*Le Roi Co., Milwaukee.

*Link-Belt Co., Chicago.

*Novo Engine Co., Lansing, Mich.

*Stover Mfg. & Eng. Co., Freeport, Ill.

*Waukesha Motor Co., Waukesha, Wis.

*Witte Engine Wks., Kansas City, Mo.

Allis-Chalmers Mfg. Co., Milwaukee.

Beaver Mfg. Co., Milwaukee, Wis.

Buda Co., Harvey, Ill.

C. H. & E. Mfg. Co., Milwaukee.

Charter Gas Eng. Co., Sterling, Ill.

Chicago Pneum. Tool Co., N. Y.

Cushman Motor Wks., Lincoln, Neb.

Fairbanks, Morse & Co., Chicago.

Foos Gas Eng. Co., Springfield, O.

Fuller & Johnson Mfg. Co., Madison, Wis.

Hinkley Motors, Inc., Detroit.

Ingersoll-Rand Co., New York.

Minneapolis Steel & Machy. Co., Minneapolis, Minn.

Sanderson-Cyclone Drill Co., Orrville, O.

Servel Mfg. Co., Evansville, Ind.

Sterling Eng. Co., Buffalo, N. Y.

Universal Motor Co., Oshkosh, Wis.

Weber Engine Co., Kansas City, Mo.

Wisconsin Motor Mfg. Co., Milwaukee.

Worthington Pump & Mch. Corp., N.Y.

ENGINES, HOISTING (See Hoists)

ENGINES, KEROSENE

*Alamo Eng. Co., Hillsdale, Mich.

*Climax Eng. Co., Clinton, Ia.

*John Lauson Mfg. Co., New Holstein, Wis.

*Stover Mfg. & Eng. Co., Freeport, Ill.

*Waukesha Motor Co., Waukesha, Wis.

ENGINES, OIL

DIESEL
Allis-Chalmers Mfg. Co., Milwaukee.

Bush-Sulzer Bros.-Duisel Eng. Co., St. Louis.

Fulton Iron Wks. Co., St. Louis.

McIntosh & Seymour Corp., Auburn, N.Y.

Nordberg Mfg. Co., Milwaukee.

St. Mary's Oil Eng. Co., St. Charles, Mo.

Western Machy. Co., Los Angeles, Cal.

SEMI-DIESEL

*Stover Mfg. & Eng. Co., Freeport, Ill.

Anderson Engine & Fdry. Co., Anderson, Ind.

Beasomer Gas Eng. Co., Grove City, Pa.

Buckeye Machinery Co., Lima, O.

Charter Gas Eng. Co., Sterling, Ill.

Chicago Pneum. Tool Co., N. Y.

De La Vergne Mach. Co., N. Y.

Fairbanks, Morse & Co., Chicago.

Foos Gas Eng. Co., Springfield, O.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

The Star Power Shovel is not limited to shallow grading. Handles bank work just as efficiently. Note high dumping elevation.



The Versatile and Efficient Star "Takes In A Lot of Ground"

**A 17-ton Power Shovel for
all kinds of jobs:**

GRADER—DIPPER

3/4-yard skimmer bucket.
Dumps 17 feet in clear in 15 ft. radius.
Maximum width of cut—42 feet.
Capacity—300 to 600 yards per day.

TRENCHER

Digs—18 feet deep.
Width—22 inches to 30 feet.
Dumps—12 to 14 feet in the clear.
Bucket never rides on heel.

WITH CLAM SHELL

Uses 1/2 yard bucket with or without teeth.
With 19-foot boom 30-foot boom
Swings clear..... 11 feet 20 feet
Carries 5000 lbs. 4200 lbs.
In radius 18 feet 25 feet
Boom raises and lowers.

**Is Full Revolving
Has Full Length Crawler
A One-Man Shovel**

Equipped with electric self-starter, mechanical trip, which trips both skimmer and dumper bucket at any position, moving or standing.

Also traction lock.

Send the coupon for the latest Star Bulletin No. 51.

**The Star Drilling Machine Co.
Akron, Ohio**

The Star Drilling Machine Co.
509 Washington Street, Akron, Ohio

Send Star Power Shovel Bulletin No. 51 for the following: Grading Equipment—Trenching Equipment—Crane and Clam.

Name

Address

GEM-527

Where to Purchase

Ingersoll-Rand Co., N. Y.
 Lombard Gov. Co., Ashland, Mass.
 Mandie Oil Eng. Co., Muncie, Ind.
 New London Ship & Eng. Co., Groton, Ct.
 Nordberg Mfg. Co., Milwaukee.
 Taylor Mach. Co., Cleveland, O.
 Weber Eng. Co., Kansas City, Mo.
 Worthington Pump & Mch. Corp., N.Y.

ENGINES, PUMPING

*Climax Eng. Co., Clinton, Ia.
 *Stover Mfg. & Eng. Co., Freeport, Ill.
 *Waukesha Motor Co., Waukesha, Wis.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Hoeven, Owens, Rentschler Co., Hamilton, O.
 Murray Iron Wks., Burlington, Ia.
 Nordberg Mfg. Co., Milwaukee.
 Worthington Pump & Mch. Corp., N.Y.

ENGINES, SWINGING

Dake Eng. Co., Grand Haven, Mich.
 Lidgerwood Mfg. Co., N. Y.

EXCAVATING MACHINERY (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY

E. H. Beaumont Co., Philadelphia
 *Link-Belt Co., Chicago

Bueyrus Co., So., Milwaukee, Wis.
 Ertzied Machy. Mfg. Co., Portland, Ore.
 Lidgerwood Mfg. Co., N. Y.
 Street Bros. Mach. Wks., Chattanooga

EXCAVATORS, CRAWLING TRACTOR

*Thev Shovel Co., Lorain, O.

EXCAVATORS, DITCH AND TRENCH

*Barber-Green Co., Aurora, Ill.

*Ray City Dredge Wks., Bay City, Mich.

*Buckeye Trac. Ditcher Co., Findlay, O.

*Evers Mach. Co., Ravenna, O.

*Clyde Ir. Wks. Sales Co., Duluth, Minn.

*Eric Steam Shovel Co., Erie, Pa.

*Inslay Mfg. Co., Indianapolis, Ind.

*Keystone Driller Co., Beaver Falls, Pa.

*Link-Belt Co., Chicago

*Moore Speedcrane Co., Chicago.

*Orton Crane & Shovel Co., Chicago.

*Parsons Co., Newton, Ia.

*Russell Grader Mfg. Co., Minneapolis

*Speeder Machy. Corp., Cedar Rapids, Ia.

*Thev Shovel Co., Lorain, O.

American Hat & Derrick Co., St. Paul.

Austin Mach. Corp., Muskegon, Mich.

Brown Hatg. Machy. Co., Cleveland.

Bucyrus Co., So., Milwaukee, Wis.

Cleveland Trencher Co., Euclid, O.

Economy Eng. Co., Iowa Falls, Ia.

Ertzied Machy. Mfg. Co., Portland, Ore.

Harnischfeger Corp., Milwaukee, Wis.

Harward Co., N. Y.

Lidgerwood Mfg. Co., N. Y.

Marion Steam Shovel Co., Marion, O.

Monighan Mach. Co., Chicago.

Osgood Co., Marion, O.

Schoefeld-Burkett Const'n Co., Macon, Ga.

Street Bros. Mach. Wks., Chattanooga

EXCAVATORS, DRAG-LINE

*Ray City Dredge Wks., Bay City, Mich.

*Evers Mach. Co., Ravenna, O.

*Clyde Ir. Wks. Sales Co., Duluth, Minn.

*Eric Steam Shovel Co., Erie, Pa.

*Gallow Ir. Wks. & Mfg. Co., Gallow, O.

*Link-Belt Co., Chicago

*Moore Speedcrane Co., Chicago.

*Orton Crane & Shovel Co., Chicago.

*Russell Grader Mfg. Co., Minneapolis

*Speeder Machy. Corp., Cedar Rapids, Ia.

*Thev Shovel Co., Lorain, O.

Austin Mach. Corp., Muskegon, Mich.

Brown Hatg. Machy. Co., Cleveland, O.

Bucyrus Co., So., Milwaukee, Wis.

Economy Eng. Co., Iowa Falls, Ia.

Ertzied Machy. Mfg. Co., Portland, Ore.

C. L. Gade Eng. Co., Iowa Falls, Ia.

Harnischfeger Corp., Milwaukee, Wis.

Hayward Co., N. Y.
 Industrial Wks. Bay City, Mich.
 Lidgerwood Mfg. Co., N. Y.
 Marion Steam Shovel Co., Marion, O.
 Monighan Mach. Co., Chicago.
 Osgood Co., Marion, O.
 Schoefeld-Burkett Const'n Co., Macon, Ga.
 Street Bros. Mach. Wks., Chattanooga

EXPANDED METAL

*Truscon Steel Co., Youngstown, O.
 Consolidated Exp. Metal Co., Wheeling, W. Va.
 Northwestern Exp. Metal Co., Chicago.
 Youngstown Pressed St. Co., Warren, O.

EXPANSION JOINT MATERIAL

*Barber Asphalt Co., Philadelphia.
 Barrett Co., N. Y.
 Philip Carey Co., Cincinnati, O.
 W. H. Meadows, Inc., Elgin, Ill.
 *Truscon Steel Co., Youngstown, O.
 Hoosier Asph. Co., Alexandria, Ind.
 Pioneer Asph. Co., Lawrenceville, Ill.
 Servicized Products Corp., Chicago.
 Texas Co., N. Y.
 Warling-Underwood Co., Philadelphia.

EXPLOSIVES

Atlas Powder Co., Wilmington, Del.
 E. I. Du Pont de Nemours & Co.,
 Wilmington, Del.
 Giant Powder Co., S. Francisco, Cal.
 Grasselli Powder Co., Cleveland, O.
 Hercules Powder Co., Wilmington, Del.

EXTENSION FRAMES, FORD TRUCK

Swedish Crucible Steel Co., Detroit.

FENCING

*American Steel & Wire Co., Chicago.
 Adrian Wire Fence Co., Adrian, Mich.
 Amer. Fence & Coast Co., New York.
 Anchor Post Fence Co., N. Y.
 Cyclone Fence Co., Waukegan, Ill.
 Duggins Wire Fence Co., Anderson, Ind.
 Fast Superior Fence Co., Warren, O.
 Ill. Wire & Mfg. Co., Joliet, Ill.
 Ind. Steel & Wire Co., Muncie, Ind.
 Interlocking Fence Co., Morton, Ill.
 Keystone Stl. & Wire Co., Peoria, Ill.
 Kokomo Stl. & Wire Co., Kokomo, Ind.
 Nitselman Bros., Muncie, Ind.
 Mich. Wire Fence Co., Adrian, Mich.
 Page Stl. & Wire Prod. Co., Bridge-
 town, O.
 Pittsburgh Stsl. Co., Pittsburgh, Pa.
 Stewart Ir. Wks. Co., Cincinnati, O.
 Tex. Cyclone Fence Co., Ft. Worth, Tex.
 Van Dorn Iron Wks. Co., Cleveland, O.
 Wickwire-Spencer Steel Co., N. Y.
 Youngstown Sheet & Tube Co., Youngs-
 town, O.

FILING EQUIPMENT STEEL

Art Metal Constr. Co., Jamestown, N.Y.
 Berger Mfg. Co., Canton, O.
 Gen. Fireproofing Co., Youngstown, O.
 Von Dorn Iron Wks. Cleveland, O.

FILTERS, OIL

S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
 Wayne Tank & Pump Co., Ft. Wayne, Ind.

FILTERS, WATER

Amer. Water Softener Co., Phila., Pa.
 Graver Corporation, E. Chicago, Ind.
 International Filter Co., Chicago.
 Norwood Eng. Co., Florence, Mass.
 Roberts Filter Co., Darby, Pa.

W. B. Scaife & Sons, Pittsburgh, Pa.

FINISHING MACHINES, CONCRETE ROAD (See Concrete Road Finishers)

FIRE ALARM SYSTEMS

Gamewall Co., Newton Upper Falls, Mass.

FIRE ALARM SIRENS

*Union Water Meter Co., Worcester,
 Mass.

Eric Elect. Siren Co., St. Paul, Minn.

Federal Sign System, Chicago.

Hendrie & Bolhoff Mfg. & Sup. Co.,
 Denver, Colo.

Sterling Siren Fire Alarm Co., Rochester, N. Y.

FIRE APPARATUS, MOTOR

*Mack Trucks, Inc., N. Y.

Ahrens-Fox Fire Eng. Co., Cincinnati, O.

American-La France Fire Eng. Co.,
 Elmira, N. Y.

Boyer Fire App. Co., Logansport, Ind.

Brockway Motor Fire App. Co., Cor-
 landt, N. Y.

Foamite-Childs Corp., Utica, N. Y.

Hale Fire Pump Co., Conshohocken, Pa.

Jaeger Portable Power Corp'n, Detroit

Northern Fire Apparatus Co., Minne-
 apolis, Minn.

Peter Pirsch & Sons Co., Kenosha, Wis.

Prospect Fire Engine Co., Prospect, O.

Seagrave Co., Columbus, O.

Stuts Fire Eng. Co., Indianapolis, Ind.

Waterous Fire Eng. Wks., St. Paul,
 Minn.

White Co., Cleveland

FIRE EXTINGUISHERS, CHEMICAL

American-LaFrance Fire Eng. Co.,
 Elmira, N. Y.

Buffalo Fire App. Corp., Buffalo, N. Y.

C. J. Cross Mfg. Co., Inc., N. Y.

Foamite-Childs Co., Utica, N. Y.

Pyrone Mfg. Co., Newark, N. J.

FIRE HOSE (See Hose, Fire)

FIRST AID EQUIPMENT

American-La France Fire Engine Co.,
 Elmira, N. Y.

FITTINGS, ACID RESISTING

*Barber Asphalt Co., Philadelphia.

FLexible joints

*Central Foundry Co., N. Y.

*U. S. G. C. Pipe & Fdry. Co., Bur-
 ling-ton, N. J.

Coldwell-Wilcox Co., Newburgh, N. Y.

Crane Co., Chicago.

United Lead Company, N. Y.

FLOOR PLATES

Allan Wood, Iron & Steel Co., Phila.
 Amer. Pressed Steel Co., Phila.
 Central Ir. & Stl. Co., Harrisburg, Pa.

FLOORING, COMPOSITION

*Barber Asphalt Co., Phila., Pa.

*Barrett Co., N. Y.

Am. Mason Safety Tr. Co., Lowell, Mass.

Johns-Manville, Inc., N. Y.

Marine Decking & Sup. Co., Phila., Pa.

Franklyn R. Muller & Co., Waukegan,

Ill.

FLOORS, WOOD BLOCK

*Barrett Co., N. Y.

Carter Blockwood Flooring Co., Kan-
 sas City, Mo.

Jennison-Wright Co., Toledo, O.

Midland Croco. Co., Toledo, O.

Republic Croco. Co., Indianapolis, Ind.

Sou. Wood Preserving Co., Atlanta, Ga.

Wyekop Pipe & Croco. Co., N. Y.

FLUSH TANKS

*Pacific Flush Tank Co., Chicago & N. Y.

FLUSHERS, STREET (See Street Finish- ers and Sprinklers)

FORGES

Buffalo Forge Co., Buffalo, N. Y.

Hank Mfg. Co., B'klyn, N. Y.

FORGES, OIL (Rivet Heating)

*Mead-Morrison Mfg. Co., E. Boston

Hank Mfg. Co., B'klyn, N. Y.

FORM CLAMPS

*Inslay Mfg. Co., Indianapolis, Ind.

*M. & M. Form Clamp Co., Minneapolis

Marion Mall. Iron Wks., Marion, Ind.

Universal Form Clamp Co., Chicago.

Williams Form Clamp Co., Chicago.

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WONDER 5-s



Outstanding WONDER Features

Distinctive shaped mixing drum revolving on a nest of ball bearings.

**Mixing drum bearing
guaranteed for the life of
mixer.**

Perfectly balanced mixing drum, tilts easily and quickly.

Thrust screw type load-
er clutch.

Main drive shaft supported in $4\frac{1}{2}$ " bronze bearing on one end, and 7" babbitted bearing on the other.

Track type loader—easily extended any time.

High grade industrial power plant—magneto equipped.

**Alemite lubrication.
Engine house with full
opening, ventilated doors.
Low, wide, quick dis-
charging loader skip.**

DO YOU KNOW another mixer that embodies so many advanced engineering features as the **WONDER** "5-S" at anywhere near its price? It has a capacity of five cubic feet of mixed concrete per batch—a one bag mixer up to and including a 1-2½-4 mix.

Compare the **WONDER "5-S"** with any other mixer of its size on the market!

That's the easiest and best way to select the right mixer. For simplicity—long life—successful performance—speedy operation—the **WONDER** "5-S" has no equal.

The **WONDER** catalog clearly pictures and describes. It will assist you in your selection and will gladly be sent upon request without obligation. Also ask for new low prices!

Construction Machinery Co., Waterloo, Iowa, U.S.A.

Founders of the Single Opening Tilting Mixer Industry

Western Office **Central Office** **Eastern Office**
485 East 3rd St., Los Angeles, Cal. 315 W. Maryland St., Indianapolis, Ind. Widener Bldg., Philadelphia, Pa.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly—Thank You.

Where to Purchase

FORMS, CONCRETE

- *Blaw-Knox Co., Pittsburgh, Pa.
- *Connery & Co., Phila., Pa.
- *Heltzel Stl. Form & Ir. Co., Warren, O.
- Lakewood Eng. Co., Cleveland, O.
- *Truscon Steel Co., Youngstown, O.
- Concrete Form Co., Inc., Syracuse, N.Y.
- Hothkiss Stl. Products Co., Binghamton, N.Y.
- Metal Forms Corp., Milwaukee.
- Raber & Lang Mfg. Co., Kendallville, Ind.

FORMGRADERS

- Edward G. Carr, Chicago.

FORMS, MANHOLE, PIPE, SEWER, ETC.

- *Heltzel Stl. Form & Ir. Co., Warren, O.

FOUNTAINS, DRINKING

- Casey-Hedges Co., Chattanooga, Tenn.
- Jas. B. Clow & Sons, Chicago.
- Crane Co., Chicago.
- Murdock Mfg. & Sup. Co., Cincinnati.
- Pure San. Dr. Fin. Co., Haydenville, Mass.

FURNITURE AND FILES, STEEL

- Art Metal Const. Co., Jamestown, N.Y.
- Gen. Fireproofing Co., Youngstown, O.
- Van Dorn Ir. Wks. Co., Cleveland, O.

FURRING AND SLEEPER ANCHORS

- Dayton Sure Grip & Shore Co., Dayton, O.

GARBAGE CANS (See Cans)
GARBAGE DISPOSAL

- American Beccari Corp., N.Y.
- C. O. Bartlett & Snow Co., Cleveland, O.
- Decarie Incinerator Co., L. I. C., N.Y.
- Goder Incinerator Corp., Chicago.
- Hiler Eng. & Const. Co., B'klyn, N.Y.
- Morse-Bouger Destructor Co., N.Y.
- Nye Odorless Crematory Co., Macon, Ga.
- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

GARBAGE TRAILERS AND BODIES

- *Highway Trailer Co., Edgerton, Wis.
- *Littleford Bros., Cincinnati.
- Atia Corp., New York.
- Lee Trailer & Body Co., Plymouth, Ind.

GARBAGE TRUCKS

- *Heil Co., Milwaukee, Wis.
- Geo. H. Holabog & Bro., Jeffersonville, Ind.
- Lee Trailer & Body Co., Plymouth, Ind.
- Rex-Watson Corp., Canastota, N.Y.
- Tiffin Wagon Co., Tiffin, O.

GAS METERS (See Meters, Gas)
GAS PRODUCERS

- Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

- R. D. Wood & Co., Phila., Pa.

GASOLINE STORAGE TANKS

- *Heil Co., Milwaukee, Wis.
- *Littleford Bros., Cincinnati, O.
- Biggs Boiler Works, Akron, O.
- Birmingham Tank Co., B'mingham, Ala.
- S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
- Chicago Bridge & Iron Wks., Chicago.
- Graver Corp., E. Chicago, Ind.
- Wm. B. Seale & Sons, Pittsburgh, Pa.
- Tekheim Oil Tank & Pump Co., Ft. Wayne, Ind.

- United Iron Wks. Inc., K. City, Mo.
- Wayne Tank & Pump Co., Ft. Wayne, Ind.

GATES, SLUICE

- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Coffin Valve Co., Boston, Mass.
- Coldwell-Wilcox Co., Newburgh, N.Y.
- E. Hardesty Mfg. Co., Denver, N.Y.
- Ladlow Valve Mfg. Co., Troy, N.Y.

GATES FOR PARKS AND CEMETERIES

- Stewart Iron Wks. Co., Cincinnati, O.

GAUGES, WATER

- Bristol Co., Waterbury, Conn.
- Lunkhenheimer Co., Cincinnati, O.
- Walworth Mfg. Co., Boston.

GAUGES, SURFACE, RESERVOIR AND SPECIAL WATER-WORKS

- Builders Iron Fdry., Providence, R.I.
- Simplex Valve & Meter Co., Phila., Pa.

GLASS, FIREPROOF (See Wire Glass)
GOVERNORS, GASOLINE ENGINE

- Pickering Governor Co., Portland, Ct.

GRADERS, ROAD (See Road Graders)
GRADER, BLADES

- *Gallow Ir. Wks. & Mfg. Co., Gallon, O.
- Russell Grader Mfg. Co., Minneapolis, J. D. Adams & Co., Indianapolis, Ind.
- Shunk Mfg. Co., Bucyrus, O.

GRAND STANDS, PORTABLE

- Circle A. Prod. Corp., Newcastle, Ind.
- Leavitt Mfg. Co., Urbana, Ill.
- Wayne Iron Wks., Wayne, Pa.

GRATING, STEEL

- *Blaw-Knox Co., Pittsburgh.

GREASE

- *Dixoyl, Inc., St. Louis.

GRINDERS AND SAND RAMMERS

- Chicago Pneum. Tool Co., N.Y.
- Cleveland Pneum. Tool Co., Cleveland, O.
- Ingersoll-Rand Co., N.Y.

GYPSUM PRODUCTS

- U. S. Gypsum Co., Chicago.
- Fenton Mfg. Co., Cleveland, O.

HAMMERS, STEAM, PILE (See Pile Hammers, Steam)
HEAT INSULATING MATERIAL

- *Philip Carey Co., Cincinnati, O.
- Johns-Manville, Inc., N.Y.

HEATING KETTLES (See Kettles)
HITCHES

- *Gustav Schaefer Wagon Co., Cleveland, O.
- Fenton Mfg. Co., Cleveland, O.

HOISTS, AUTOMATIC

- *Zetterlund Hst. & Mach. Co., Milwaukee

HOISTS, BELT-DRIVEN

- *Amer. Saw Mill Mch. Co., Hackettstown, N.J.

HOISTS, CONCRETE, TOWER

- *Domestic Eng. & Pump Co., Shippensburg, Pa.

HOISTS, ELECTRIC

- *Clyde Iron Wks. Sales Co., Duluth, Minn.

HOISTS, ELECTRIC

- *S. Flory Mfg. Co., Bangor, Pa.

HOISTS, FORDSON

- *Harnischfeger Corp., Milwaukee.

HOISTS, GASOLINE

- *Mead-Morrison Mfg. Co., E. Boston.

HOISTS, GASOLINE

- *Mundy Sales Corp., N.Y.

HOISTS, STEAM

- *Clyde Iron Wks. Sales Co., Duluth, Minn.

HOISTS, STEAM

- *Denver Rock Drill Mfg. Co., Denver.

HOISTS, STEAM

- *S. Flory Mfg. Co., Bangor, Pa.

HOISTS, STEAM

- *Inaley Mfg. Co., Indianapolis, Ind.

HOISTS, STEAM

- *Mead-Morrison Mfg. Co., E. Boston.

HOISTS, STEAM

- *Mundy Sales Corp., N.Y.

HOISTS, STEAM

- *Amer. Hoist & Derrick Co., St. Paul, Minn.

HOISTS, STEAM

- Dake Engine Co., Grand Haven, Mich.

HOISTS, STEAM

- Hardie-Tynes Mfg. Co., Birmingham, Ala.

HOISTS, STEAM

- Ingersoll-Rand Co., N.Y.

HOISTS, STEAM

- Lidgerwood Manufacturing Co., N.Y.

HOISTS, STEAM

- Orr & Sembower, Reading, Pa.

HOISTS, STEAM

- Street Bros. Mach. Wks., Chattanooga.

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- Thomas Elevator Co., Chicago.

HOISTS, STEAM

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- *Wood Hydr. Hoist & Body Co., Detroit.
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- Rock Mfg. Co., Waterloo, N. Y.
- Van Dorn Iron Wks., Cleveland, O.

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- *Inaley Mfg. Co., Indianapolis, Ind.
- *Lakewood Eng. Co., Cleveland, O.
- *Littleford Bros., Cincinnati, O.
- *Ransome Conc. Mch. Co., Dunellen, N.J.
- Jas. B. Seavers Co., Batavia, Ill.
- Butler Bin Co., Waukesha, Wis.

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- *The Dallett Co., Phila., Pa.
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- Ingersoll-Rand Co., N. Y.
- Mulcahy Co., Inc., Phila., Pa.
- Penna. Flexible Metallic Tubing Co., Phila., Pa.
- Republic Rubber Co., Youngstown, O.
- U. S. Rubber Co., N. Y.

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- Bi-Lateral Fire Hose Co., Chicago.
- Kureka Fire Hose Mfg. Co., N. Y.
- Fabric Fire Hose Co., N. Y.
- B. P. Goodrich Rubber Co., Akron, O.
- Goodyear Tire & Rubber Co., Akron, O.

HOUSE-MOVING EQUIPMENT

- *La Plant-Chester Mfg. Co., Cedar Rapids, Ia.

HOUSE NUMBERS

- Hamilton Metal Prod. Co., Hamilton, O.
- Niagara Metal Stamping Corp., Niagara Falls, N. Y.

HOUSES, PORTABLE (See Buildings, Portable)

HYDRANTS, FIRE

- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Columbian Ir. Wks., Chatta., Tenn.
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Eddy Valve & Mfg. Co., Waterford, N.Y.
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- Kennedy Valve Mfg. Co., Elmsira, N. Y.
- Ludlow Valve Mfg. Co., Troy, N. Y.
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- Rensselaer Valve Co., Troy, N. Y.
- A. P. Smith Mfg. Co., E. Orange, N. J.
- R. D. Wood & Co., Phila., Pa.

HYDRAULIC RAMS

- Deming Co., Salem, O.
- Rife Hydraulic Engine Co., N. Y.
- Rumsey Pump Co., Seneca Falls, N. Y.
- Seattle Mach. Works, Seattle, Wash.

ICE-MAKING MACHINERY

- Arctic Ice Mach. Co., Canton, O.
- Baker Ice Mach. Co., Omaha, Neb.
- Brunswick-Kroeschell Co., N. Bruns-wick, N. H.
- Carbondale Mach. Co., Carbondale, Pa.
- De La Vergne Mach. Co., N. Y.
- Frick Co., Inc., Waynesboro, Pa.
- Ingersoll Rand Co., New York.
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- United Iron Wks., Inc., K. City, Mo.
- Vilter Mfg. Co., Milwaukee, Wis.
- Henry Vogt Mach. Co., Louisville, Ky.
- York Mfg. Co., York, Pa.

INCINERATORS, GARBAGE (See Garbage Disposal)

INDICATOR POSTS (See Valves)

INSPECTING LABORATORIES

- *Conard & Busby, Burlington, N. J.
- *Pittsburgh Testing Lab., Pittsburgh.
- Allentown Testing Lab., Allentown, Pa.
- E. L. Conwell & Co., Phila., Pa.
- Gulick-Henderson Co., N. Y.
- Robert W. Hunt & Co., Chicago
- N. Y. Testing Lab., N. Y.
- Standard Testing Lab., Inc., N. Y.

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- Warren Knight Co., Phila., Pa.
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IRON WORK, STRUCTURAL AND ORNAMENTAL (See Bridges and Buildings)

JACKS LIFTING

- *McKiernan-Terry Drill Co., N. Y.
- *Templeton, Kenly & Co., Ltd., Chicago.
- Duff Mfg. Co., Pittsburgh, Pa.
- Joyce-Cridland Co., Dayton, O.
- A. O. Norton, Inc., Boston
- Oil Jack Co., N. Y.
- Rees Mfg. Co., Pittsburgh, Pa.
- Watson-Stillman Company, N. Y.

JACKS, PIPE FORCING

- Duff Mfg. Co., Pittsburgh, Pa.

JAIL AND PRISON WORK

- E. T. Barnum Iron Wks., Detroit
- Fries & Son Steel Const. & Eng. Co., Covington, Ky.
- Panly Jail Bldg. Co., St. Louis, Mo.
- Stewart Iron Wks. Co., Cincinnati, O.
- Van Dorn Ir. Wks. Co., Cleveland, O.

JOINTS, EXPANSION PAVING (See Expansion Joint Material)

JOINTS, FLEXIBLE PIPE (See Flexible Joints)

JOISTS, STEEL

- *Truscon Steel Co., Youngstown, O.
- Berger Mfg. Co., Canton, O.
- Gen'l Firepf. Bldg. Products, Youngstown, O.

KETTLES, FOR ASPHALT AND TAR

- *Acme Rd. Mach. Co., Frankfort, N. Y.
- *Aeroil Burner Co., Union Hill, N. J.
- *Barber Asphalt Co., Phila., Pa.
- *Connery & Co., Inc., Phila., Pa.
- *Good Rds. Mch. Co., Kennett Sq., Pa.
- *Jos. Honhorst Co., Cincinnati, O.
- *Kinney Mfg. Co., Boston, Mass.
- *Littleford Bros., Cincinnati, O.
- *Spears-Wells Mch. Co., Oakland, Cal.
- *Union Iron Works, Inc., Hoboken, N.J.
- Birmingham Tank Co., Birmingham, Ala.

CHASE & LYMAN, BOSTON, MASS.

- Chasse Oil Burner Co., Elkhart, Ind.
- Hlck Mfg. Co., B'klyn., N. Y.
- MacLeod Co., Cincinnati, O.
- G. L. Stuebner Ir. Wks., Inc., Long Island City, N. Y.

TARRANT MFG. CO., SARATOGA SPRINGS, N.Y.

- Universal Rd. Mach. Co., Kingston, N.Y.

LANTERNS, CONTRACTORS'

- *Alex. Milburn Co., Baltimore, Md.
- Defiance Lantern & Stamping Co., Rochester, N. Y.
- R. E. Dietz Co., N. Y.
- Handian, Buch Mfg. Co., St. Louis
- Star Headlight & Lantern Co., Rochester, N. Y.

LATH, METAL

- *Truscon Steel Co., Youngstown, O.
- Berger Mfg. Co., Canton, O.
- Bostwick Steel Lath Co., Niles, O.
- Milwaukee Corr. Co., Milwaukee, Wis.
- Northwestern Exp. Metal Co., Chicago
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- Sykes Metal Lath and Roofing Co., Niles, O.
- Youngstown Pressed Steel Co., Warren, O.

LAWN MOWERS

- *Kinney Standards, Inc., B'klyn., N. Y.
- Chadburn & Coldwell Mfg. Co., Newburgh, N. Y.
- Coldwell Lawn Mower Co., Newburgh, N.Y.
- Gilson Mfg. Co., Port Washington, Wis.
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- S. P. Townsend Co., Bloomfield, N. J.
- Western Implement Co., Port Washington, Wis.
- Worthington Mower Co., Stroudsburg, Pa.

LEADITE

- The Leadite Co., Phila., Pa.

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- *Aeroll Burner Co., Union Hill, N. J.
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- Canton Fdry. & Mch. Co., Canton, O.
- Chicago Flexible Shaft Co., Chicago
- Geo. Focht's Sons, Hoboken, N. J.
- Hauck Mfg. Co., B'klyn., N. Y.
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LETTERING GUIDES

- Wood-Regan Instrument Co., N. Y.

LETTERS AND FIGURES, METAL

- Nigara Metal Stamp. Corp., Niagara Falls, N. Y.

LIGHTS, CONTRACTORS'

- *Alex. Milburn Co., Baltimore, Md.
- General Elec. Co., Schenectady, N. Y.
- Carbie Mfg. Co., Duluth, Minn.
- MacLeod Co., Cincinnati, O.
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- *Bay City Dredge Wks., Bay City, Mich.
- *Chicago Automatic Conv. Co., Chicago
- *Chain Belt Co., Milwaukee, Wis.
- *Galion Ir. Wks. & Mfg. Co., Galion, O.
- *Geo. Haiss Mfg. Co., N. Y.
- *Heitzel Stl. Fmn. & Ir. Co., Warren, O.
- *Link-Belt Co., Chicago
- *Portable Machinery Co., Clifton, N. J.
- *Russell Grader Mfg. Co., Minneapolis
- *Sauermaier Bros., Chicago
- *T. L. Smith Co., Milwaukee, Wis.
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Fred. Medart Mfg. Co., St. Louis, Mo.
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Milwaukee Loc. Mfg. Co., Milwaukee
Plymouth Loc. Wks., Plymouth, O.
H. K. Porter Co., Pittsburgh, Pa.
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***Dixoyl, Inc., St. Louis**
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- METAL LATH (See Lath)**
- METAL ROOFING (See Roofing)**
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Clarkville Fdry. & Mach. Co., Clarksville, Tenn.
J. B. Clow & Sons, Chicago
Columbia Ir. Wks., Chattanooga, Tenn.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
J. B. Schofield's Sons Co., Macon, Ga.
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***Pittsburgh Equitable Meter Co., Pittsburgh, Pa.**
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Ford Meter Box Co., Wabash, Ind.
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National Meter Co., N. Y.
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Sangamo Elec. Co., Springfield, Ill.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
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American Meter Co., N. Y.
Bailey Meter Co., Cleveland, O.
Bailey Iron Fdry., Providence, R. I.
Cleveland Gas Meter Co., Cleveland, O.
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Thomson Meter Corp., New York
Worthington Pump & Mch'y. Corp., N.Y.
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Builders Iron Fdry., Providence, R. I.
Simplex Valve & Meter Co., Phila., Pa.
- MIXERS, CONCRETE (See Concrete Mixers)**
- MIXERS, GROUT**
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***Barber Asphalt Co., Phila., Pa.**
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Austin Mach. Corp., Muskegon, Mich.
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Knickerbocker Co., Jackson, Mich.
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Marsh-Capron Co., Chicago
Talbot-Flood Mfg. Co., Kansas City, Mo.
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Meili-Blumberg Co., New Holstein, Wis.
Talbot-Flood Mfg. Co., Kansas City, Mo.
- MOTORCYCLES**
Cleveland Motorcycle Co., Cleveland, O.
Excelsior Motor Mfg. & Supply Co., Chicago
Harley-Davidson Motor Co., Milwaukee
Indian Motorcycle Co., Springfield, Mass.
- MOTORS, ELECTRIC (See Electric Generators and Motors)**
- MOTORS, GASOLINE (See Engines, Gas and Gasoline)**
- MOTOR TRUCKS**
***Graham Bros., Detroit**
***Mack Trucks, Inc., New York**
Acme Motor Truck Co., Cadillac, Mich.
Atterbury Motor Car Co., Buffalo, N. Y.
Autocar Co., Ardmore, Pa.
Bessemer Motor Truck Co., Grove City, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
Clydesdale Motor Truck Co., Clyde, O.
Commerce Motor Trk. Co., Ypsilanti, Mich.
- PAINT GUNS**
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Binks Spray Eq. Co., Chicago
Chicago Pneum. Tool Co., New York
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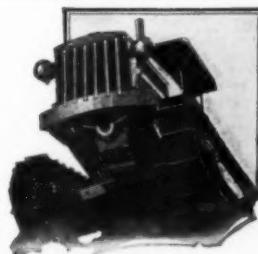
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- Detroit White Lead Wks., Detroit
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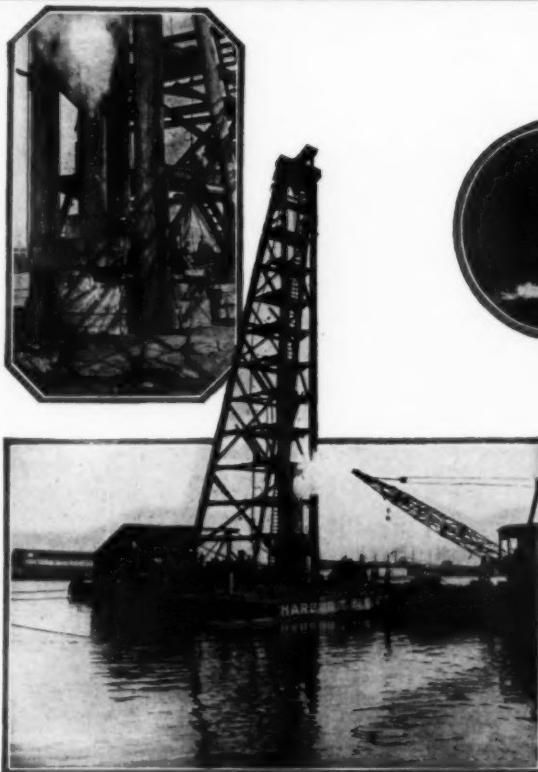
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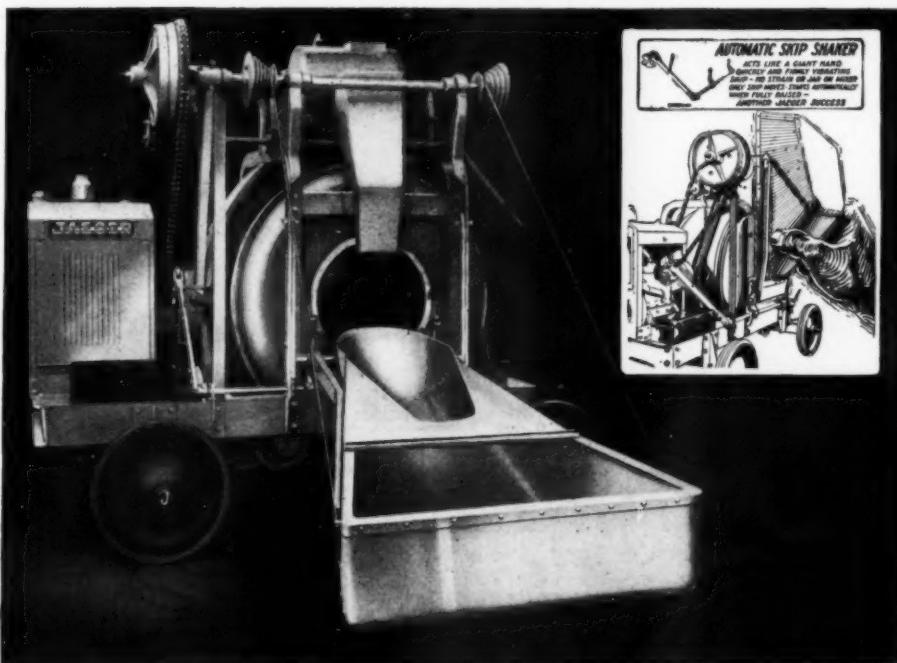
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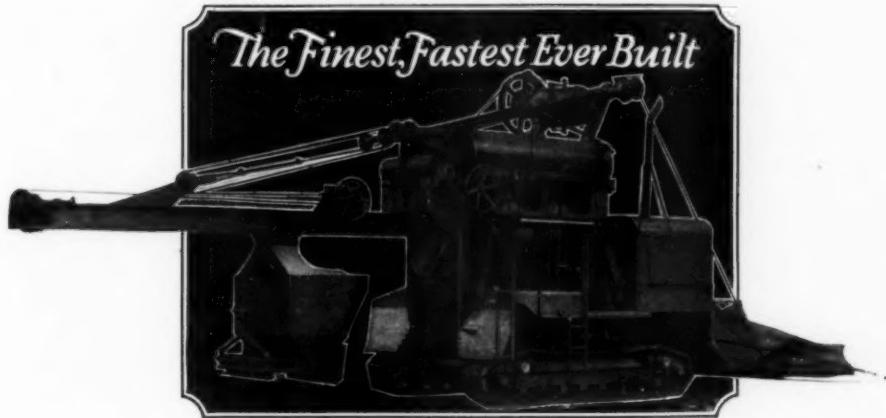
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- Pittsburgh Shovel Co., Pittsburgh, Pa.
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- Wood Shovel & Tool Co., Piqua, O.
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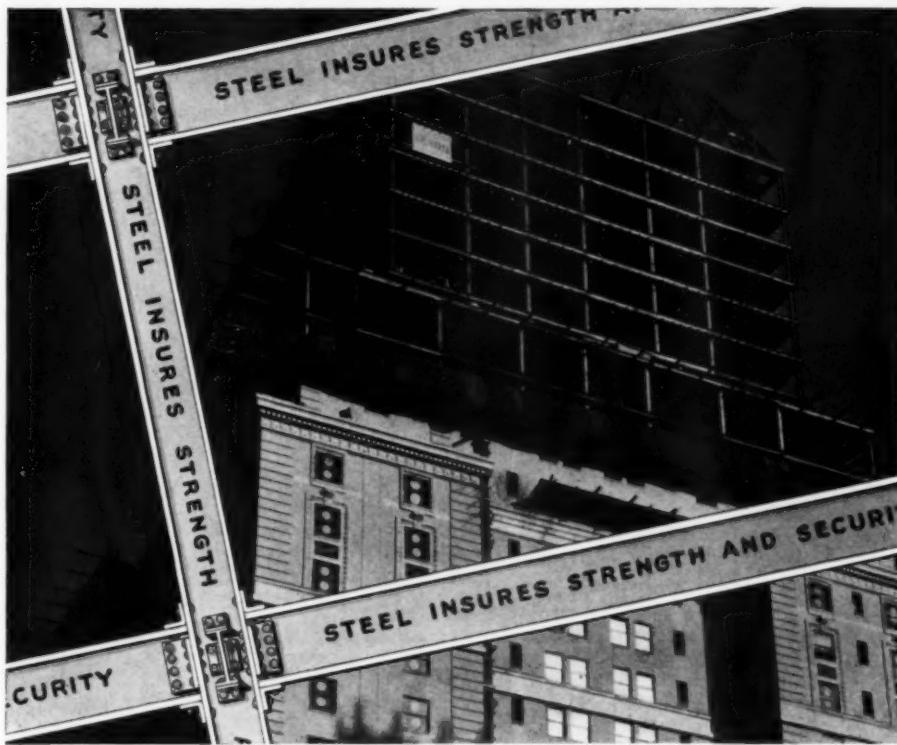
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- Yellow Truck & Coach Mfg. Co., Chicago

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CONTRACTORS' & ENGINEERS' MONTHLY



BUILD BETTER...WITH STEEL



Nothing but Steel is good enough! The most dependable material: Steel! Only Steel will stand *any* shock! . .

These are headlines of advertising appearing as part of the extensive educational program now being carried on by the American Institute of Steel Construction. This advertising supplements the authoritative publications, counsel, and researches of the Institute.

Already the Institute's influence has been reflected in the adoption of its standard specification and the

use of its Code of Practice in more than 100 important cities in the United States and Canada, with an estimated saving of \$30,000,000 a year to owners and taxpayers. Send for your copy of the Specification, Code of Practice, and the illustrated fact-book of structural steel, "STEEL NEVER FAILS."

This advertisement is published by the American Institute of Steel Construction, a non-profit service organization of 212 members comprising the structural steel industry in the United States and Canada. Contributing also to the educational fund are these great rolling mills: Bethlehem Steel Company, The Colorado Fuel and Iron Company, Inland Steel Company, Jones & Laughlin Steel Corporation, Bessemer Steel Company. The purpose of the Institute is to extend the use of structural steel in construction work of every size and type, from residences to skyscrapers and bridges. The Institute offers full cooperation with architects, engineers, the public and all branches of the building trades. Correspondence invited. Address: Leo H. Miller, M. Am. Soc. C. E. Chief Engineer, American Institute of Steel Construction, Inc., 885 Madison Avenue, New York City.

Where to Purchase

STREET LAMP POSTS

*Nove Engine Co., Lansing, Mich.
American Conc. Prod. Co., Chicago.
Chicago Cone Post Co., Chicago.
J. B. Clow & Sons, Chicago.
Electric Ry. Equip. Co., Cincinnati, O.
King Mfg. Co., Chicago.
Union Metal Mfg. Co., Canton, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

STREET SIGNS (See Signs, Street)
STREET SWEEPERS

*Austin-Western Rd. Machy. Co., Chicago.
*Good Rds. Mach. Co., Kennett Sq., Pa.
*Kinney Mfg. Co., Boston.
Butler Mfg. Co., Cleveland, O.
Elgin Sales Corp., N. Y.
Foamite-Childe Corp., Utica, N. Y.

STREET SWEEPING BROOMS

*Littleford Bros., Cincinnati, O.
J. I. Holcomb Mfg. Co., Indianapolis, Ind.
Brush & Broom Mfg. Co., Indianapolis, Ind.
Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Jos. Lay Co., Ridgeville, Ind.
Milwaukee Brush Mfg. Co., Milwaukee.
Osborn Mfg. Co., Cleveland, O.

**STREET SWEEPING BROOMS
REFILLED**

Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Osborn Mfg. Co., Cleveland, O.

STUMP PULLERS

*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*La Plant-Cheate Mfg. Co., Cedar Rapids, Ia.
Erected Machy. Mfg. Co., Portland, Ore.
H. L. Bennett & Co., Westerville, O.
Thomas Elevator Co., Chicago.
John Waldron Corp., New Brunswick, N. J.

SUBGRADING MACHINES

*Lakewood Eng. Co., Cleveland, O.
The Hug Co., Highland, Ill.
Shaw-Eenoche Tractor Co., Minneapolis.

SUPERHEATERS

Babcock & Wilcox Co., N. Y.
Power Specialty Co., N. Y.

Superheater Co., N. Y.

SURVEYOR'S INSTRUMENTS (See Instruments)
SWITCHBOARDS

Allis-Chalmers Mfg. Co., Milwaukee.
General Elec. Co., Schenectady, N. Y.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TAMPING MACHINES

Chicago Pneum. Tool Co., N. Y.
Harnischfeger Corp., Milwaukee, Wis.
Ingersoll-Rand Co., N. Y.

TANKS, AIR COMPRESSOR

*Connery & Co., Inc., Philadelphia.
*Curtis Pneum. Machy. Co., St. Louis, Mo.
*Hall Co., Milwaukee, Wis.

*Littleford Bros., Cincinnati, O.
Abendroth & Root Mfg. Co., N. Y.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Wks., Chicago.

Chicago Pneum. Tool Co., N. Y.
Graver Corp., E. Chicago, Ind.
Independent Pneum. Tool Co., Chicago.
Indiana Air Pump Co., Indianapolis.

Ingersoll-Rand Co., N. Y.
Lancaster Iron Wks., Lancaster, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Wks. Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

W. B. Scaife & Sons, Pittsburgh, Pa.
Westinghouse Tract. Brake Co., Wilmerding, Pa.
Worthington Pump & Machy. Corp., N. Y.

TANKS, STEEL

*Connery & Co., Philadelphia.
*Hall Co., Milwaukee, Wis.
*Jos. Honhorst Co., Cincinnati, O.
*Littleford Bros., Cincinnati, O.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowes & Co., Inc., Ft. Wayne, Ind.
J. I. Case Threshing Mach. Co., Racine, Wis.

W. E. Caldwell Co., Louisville, Ky.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.

Chicago Bridge & Iron Wks., Chicago.
Columbian St. Tank Co., K. City, Mo.
Dover Boiler Wks., N. Y.
Farrell Mfg. Co., Joliet, Ill.
C. C. Fouts Co., Middletown, O.
Graver Corp., E. Chicago, Ind.
R. Hardesty Mfg. Co., Denver, Col.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Wks., Lancaster, Pa.
N. Y. Central Irr. Wks. Co., Hagerstown, Md.

Pacific Tank & Pipe Co., San Francisco.
Petroleum Iron Wks. Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh
United Iron Wks., Inc., K. City, Mo.
Walsh & Weidner Boiler Co., Chattanooga, Tenn.

Wayne Tank & Pump Co., Ft. Wayne, Ind.

TANKS, WOOD

W. E. Caldwell Co., Louisville, Ky.
G. M. Davis & Son, Palatka, Fla.
Eagle Tank Co., Chicago.

Hauser-Stander Tank Co., Cincinnati, O.
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.

Nat'l. Tank & Pipe Co., San Francisco
Pacific Tank & Pipe Co., San Francisco.
Redwood Mfrs. Co., San Francisco.

A. T. Stearns Lumber Co., Boston.
U. S. Wind Eng. & Pump Co., Batavia, Ill.

Wendnagel & Co., Chicago.

TANK WAGONS

*Acme Rd. Mach. Co., Frankfort, N. Y.
*Galion Ir. Wks. & Mfg. Co., Galion, O.
*Hall Co., Milwaukee, Wis.

*Jos. Honhorst Co., Cincinnati, O.

*Mack Trucks, Inc., N. Y.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Mach. Co., Racine, Wis.

TAPES, STEEL AND METALLIC

*Lufkin Rule Co., Saginaw, Mich.
Eugene Dietzgen Co., N. Y.

Keuffel & Esser Co., Hoboken, N. J.
The L. S. Starrett Co., Athol, Mass.

TAB

*Barrett Co., N. Y.
Amer. Tar Prod. Co., Pittsburgh, Pa.

TAR KETTLES (See Kettles)
THAWING OUTFITS

*Aeroll Burner Co., Union Hill, N. J.
*Littleford Bros., Cincinnati.

Hauke Mfg. Co., Bklyn., N. Y.

TIE TAMERS

Electric Tamper & Equip. Co., Chicago.

TIE BOLTS FOR WALL FORMS

*Hawley Tie Bolt Co., Minneapolis.

TIES, STEEL

Carnegie Steel Co., Pittsburgh, Pa.
Int'l. Steel Tie Co., Cleveland, O.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TIMBER CLAMPS

Pyle-Rogers Corp., N. Y.

TIRES, RUBBER (For Motor Trucks)

Firestone Tire & Rubber Co., Akron, O.
Fish Tire Co., Chicopee Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., Akron, O.
U. S. Tire Co., N. Y.

TOOL HOUSES, PORTABLE STEEL

*Blaw-Knox Co., Pittsburgh, Pa.
*Littleford Bros., Cincinnati, O.

TORCHES, OIL (HEATING)

*Littleford Bros., Cincinnati.

*Mead-Morrison Mfg. Co., E. Boston.

*Alex. Milburn Co., Baltimore, Md.

Chause Oil Burner Co., Elkhart, Ind.

Hauck Mfg. Co., Bklyn., N. Y.

TOWERS (See Standpipe, Tanks and Towers)
TRACKS, INDUSTRIAL AND PORTABLE

*Easton Car & Constr. Co., Easton, Pa.
*Lakewood Eng. Co., Cleveland, O.

Atlas Car & Mfg. Co., Cleveland, O.

Bethlehem Steel Co., Bethlehem, Pa.

Chase Dry & Mfg. Co., Columbus, O.

O. W. Hurt Co., Inc., N. W. Brighton, N. Y.

Koppel Ind. Car & Equip. Co., Koppel, Pa.

Sweet's Steel Co., Williamsport, Pa.

TRACTION TREADS

*Trackson Co., Milwaukee.

Belle City Mfg. Co., Racine, Wis.

Tractor Grip Wheel Co., Toledo, O.

TRACTORS

*Bates Mfg. Co., Joliet, Ill.

*Caterpillar Tractor Co., San Leandro, Calif.

*Cleveland Tractor Co., Cleveland, O.

Geo. Hains Mfg. Co., New York.

Huber Mfg. Co., Marion, O.

J. T. Tractor Co., Cleveland, O.

*John Lauseon Co., New Holstein, Wis.

*Mack Trucks, Inc., N. Y.

*Mead-Morrison Mfg. Co., E. Boston.

*Monarch Tractors Corp., Springfield, Ill.

Advance-Rumely Thresher Co., Lapeer, Ind.

Allis-Chalmers Mfg. Co., Milwaukee.

Clark Tractor Co., Buchanan, Mich.

Emerson-Brantingham, Rockford, Ill.

Ford Motor Co., Detroit, Mich.

Hart-Parr Co., Charles City, Ia.

Int'l. Harvester Co., Chicago.

Kinnard & Haines, Minneapolis, Minn.

Lombard Tractor & Truck Corp., N. Y.

Minneapolis Steel & Mach. Co., Minneapolis.

Rogers Bros. Corp., Albion, Pa.

Shaw-Eenoche Tractor Co., Minneapolis, Wis.

TRACTOR ACCESSORIES

*Trail-IT Co., St. Paul, Minn.

Pickering Governor Co., Portland, Conn.

TRACTOR HITCHES

*Trail-IT Co., St. Paul, Minn.

TRAFFIC LINE MARKERS

Continental Prod. Co., Euclid, O.

Line-O-Graph Co., N. Y.

Tenn. Tool Wks. Inc., Knoxville, Tenn.

TRAFFIC PAINT

J. E. Bauer Co., Los Angeles, Cal.

Continental Prod. Co., Euclid, O.

Handline Bros., Baltimore, Md.

Hoosier Paint Wks., Ft. Wayne, Ind.

Sewall Paint & Varnish Co., K. City, Mo.

Sherwin-Williams Co., Cleveland, O.

Tropical Paint & Oil Co., Cleveland, O.

Truscon Laboratories, Detroit, Mich.

Wambin Paint & Varnish Works, Rochester, N. Y.

TRAFFIC SIGNS (See Signs, Traffic)

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*

TRACKSON CRAWLER



Works Where Wheels Wont!

POWER to pull through soft, muddy soil. Crawler tracks to go where wheels mire. *That's the Trackson-Fordson.* In no other 2-ton crawler tractor will you find a more economical combination of both. In the Trackson-Fordson you get the greatest track area for "tough" pulls; you get lowest ground pressure per pound of weight for work in mud, sand, swampy lands; you get increased drawbar power; you get an all-steel crawler that converts the Fordson into the most generally adaptable 2-ton crawler tractor for contracting work. This is what it will do — cut your costs on grading, leveling, ditching, trench-filling, excavating, loading, hauling and hundreds of other profitable uses.

There's a *special contracting bulletin*—you can have it for the asking. It shows you pictures of other jobs like yours, where Tracksons have cut operating costs. Send back the coupon for it. Do it today.

Trackson Company

MAKERS OF FULL-CRAWLERS

519 CLINTON ST.

MILWAUKEE, WIS.

These
6 Advantages Are
Combined in no
Other Crawler

1. All-steel construction—no cast iron parts.
2. Fewest working parts—lowest upkeep cost.
3. Patented non-clogging track of specially hardened alloy steel.
4. Greater track area—better traction—less ground pressure.
5. Oil reservoir type dirt-proof bearings.
6. Simple steering—no complicated clutches.



■ Trackson Company, 519 Clinton St., Milwaukee, Wis.
■ Gentlemen—Without any obligation please send me specific information on the class of work indicated.
() Grading () Loading () Fresno
() Excavating () Hauling () Backfilling
■ Name _____
■ Address _____

Where to Purchase

TRAILERS FOR TRUCKS AND TRACTORS

- *Eagle Wagon Wks., Auburn, N. Y.
- *Eaton Car & Const'n. Co., Easton, Pa.
- *Highway Trailer Co., Edgerton, Wis.
- *Le Plant-Chote Mfg. Co., Cedar Rapids, Ia.
- Miami Trailer-Scraper Co., Troy, O.
- Rex-Watson Corp., Canastota, N. Y.
- *Gustav Schaefer Wagon Co., Cleveland.
- *Whitehead & Kales Co., Detroit, Mich.
- Arcadia Trailer Corp., Newark, N. Y.
- Detroit Trailer & Mach. Co., Detroit.
- Fuchsau-Trailer Co., Detroit, Mich.
- Herckules Trailer Mfg. Co., Los Angeles.
- Lee Trailer & Body Co., Chicago.
- Rogers Bros. Corp., Albion, Pa.
- Squier-Kir Co., Milwaukee, Wis.
- Trail-Ford Co., Ann Arbor, Mich.
- Traimobile Co., Cincinnati.
- Troy Trailer & Wagon Co., Troy, O.
- Warner Mfg. Co., Beloit, Wis.

TRAILERS, INDUSTRIAL

- *Eaton Car & Const'n. Co., Easton, Pa.
- *Highway Trailer Co., Edgerton, Wis.
- *Lakewood Eng. Co., Cleveland, O.
- *Le Plant-Chote Mfg. Co., Cedar Rapids, Ia.
- Gustav Schaefer Wagon Co., Cleveland.
- *Whitehead & Kales, Detroit, Mich.
- Chase Fdry. & Mfg. Co., Columbus, O.
- Detroit Trailer & Mach. Co., Detroit.
- Electric Wheel Co., Quincy, Ill.
- Lee Trailer & Body Co., Plymouth, Ind.
- Miami Trailer-Scraper Co., Troy, O.
- Traimobile Co., Cincinnati.

TRAMWAYS, AERIAL WIRE ROPE (See Aerial Wire Rope Tramways)

TRANSFORMERS

- Allis-Chalmers Mfg. Co., Milwaukee.
- Duncan Elec. Mfg. Co., Lafayette, Ind.
- Enterprise Elec. Co., Warren, O.
- General Elec. Co., Schenectady, N. Y.
- Kuhlman Elec. Co., Bay City, Mich.
- Maloney Elec. Co., St. Louis, Mo.
- Packard Elec. Co., Warren, O.
- Pittsburgh Transf. Co., Pittsburgh, Pa.
- Wagner Elec. Corp., St. Louis, Mo.
- Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TRANSITS AND LEVELS (See Instruments)

TRANSMISSION (Auxiliary & Replacement)

- *Fuller & Sons Mfg. Co., Kalamazoo, Mich.
- Waukesha Motor Co., Waukesha, Wis.
- Hinkley Motors, Inc., Detroit.
- Lincoln Mfg. Co., Connersville, Ind.
- Muncie Gear Wks., Muncie, Ind.
- Huckstall Sales & Mfg. Co., N. Y.
- Warford Corp., N. Y.

TRANSMISSION MACHINERY, POWER

- *Chain Belt Co., Milwaukee, Wis.
- Link-Belt Co., Chicago.
- Allis-Chalmers Mfg. Co., Milwaukee.
- Dodge Mfg. Corp., Mishawaka, Ind.
- Webster Mfg. Co., Chicago.
- Weller Mfg. Co., Chicago.

TRASH CANS (See Cans)

TREADS, SAFETY

- Amer. Abrasive Metals Co., N. Y.
- Amer. Mason Safety Tread Co., Lowell, Mass.
- Concrete Steel Co., N. Y.
- Norton Co., Worcester, Mass.

TRENCH EXCAVATOR (See Excavators)

TRENCH PUMPS (See Pumps, Contractors')

TURBINES

- Allis-Chalmers Mfg. Co., Milwaukee.
- De Laval Steam Turbine Co., Trenton, N. J.
- General Elec. Co., Schenectady, N. Y.
- Ingersoll-Rand Co., N. Y.
- Terry Steam Turb. Co., Hartford, Ct.
- Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TURNTABLES FOR MOTOR TRUCKS

- *Blaw-Knox Co., Pittsburgh, Pa.
- *Eaton Car & Const. Co., Easton, Pa.
- Champion Eng. Co., Kenton, O.
- Freeman Mfg. Co., Racine, Wis.
- Hug Co., Highland, Ill.
- Western Structural Co., Moline, Ill.

VALVES, ACID RESISTING

- *Barber Asphalt Co., Philadelphia.

VALVES, CHECK

- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Coffin Valve Co., Boston.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Mich. Valve & Fury Co., Detroit.
- Rensselaer Valve Co., Troy, N. Y.

VALVES, GATE AND INDICATOR POSTS

- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Coffin Valve Co., Boston.
- Columbian Ir. Wks., Chattanooga, Tenn.
- Crane Company, Chicago.
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Eddy Valve Co., Waterford, N. Y.
- Fairbanks Co., N. Y.
- Iowa Valve Co., Okaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Rensselaer Valve Co., Troy, N. Y.
- A. P. Smith Mfg. Co., E. Orange, N. J.
- R. D. Wood & Co., Philadelphia.

VALVES, PRESSURE SEALED

- Cleveland Pneum. Tool Co., Cleveland, Ohio.

VALVES, TAPPING

- Eddy Valve Co., Waterford, N. Y.
- Hays Mfg. Co., Erie, Pa.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Co., Troy, N. Y.
- Michigan Valve & Fdry. Co., Detroit.
- Rensselaer Valve Co., Troy, N. Y.
- A. P. Smith Mfg. Co., E. Orange, N. J.

VALVE BOXES AND HOUSINGS

- *Central Fdry. Co., N. Y.
- *U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- H. W. Clark Co., Mattoon, Ill.
- J. B. Clow & Sons, Chicago.
- Columbian Ir. Wks., Chattanooga, Tenn.
- Darling Valve & Mfg. Co., W. Marquette, Pa.
- Eddy Valve Co., Waterford, N. Y.
- Fairbanks Co., N. Y.
- Iowa Valve Co., Okaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Mueler Co., Decatur, Ill.
- Rensselaer Valve Co., Troy, N. Y.
- A. P. Smith Mfg. Co., E. Orange, N. J.
- R. D. Wood & Co., Philadelphia.

WAGONS (See Dump Carts and Wagons)

WAGON BODIES (See Dump Bodies)

WAGON LOADERS (See Loaders, Gravel WALLBOARD)

- Beaver Prod. Co., Inc., Buffalo, N. Y.
- Bird & Son, Inc., E. Walpole, Mass.
- Cornell Wood Prod. Co., Chicago.
- Haverhill Box Board Co., Haverhill, Mass.

- MacAndrews & Forbes Co., N. Y.
- Plasteron Wall Board Co., Buffalo, N.Y.
- U. S. Gypsum Co., Chicago.
- Upson Co., Lockport, N. Y.
- Waldorf Paper Prod. Co., St. Paul, Minn.

WALL TIRES

- Berger Mfg. Co., Canton, O.
- Concrete Steel Co., N. Y.
- Consolidated Exp. Metal Co., Wheeling, W. Va.
- Milwaukee Corr. Co., Milwaukee, Wis.
- Niagara Metal Stamp. Corp., Niagara Falls, N. Y.

WATER MAIN CLEANING

- Nat'l. Water Main Cleaning Co., N. Y.

WATER MAIN TAPPING MACHINES

- *Hays Mfg. Co., Erie, Pa.
- Mueler Co., Decatur, Ill.
- A. P. Smith Mfg. Co., E. Orange, N. J.

WATER METERS (See Meters, Water)

WATERPROOFING COMPOUNDS AND MATERIAL

- *Barber Asphalt Co., Philadelphia.
- *Barrett Company, N. Y.
- *Philly Carb. Co., Cincinnati, O.
- *Standard Oil Co. (Indiana), Chicago.
- Atlantic Refining & Asphalt Corp., Phila.
- Euclid Chemical Co., Cleveland.
- General Firep'g Co., Youngstown, O.
- Master Builders Co., Cleveland, O.
- Minwax Co., N. Y.
- Protexol Corp., N. Y.
- Ruberoid Co., N. Y.
- Sandusky Cement Co., Cleveland, O.
- Sonnenborn Sons, Inc., N. Y.
- Texas Company, N. Y.
- Toch Brothers, N. Y.
- Truscon Laboratories, Detroit, Mich.

WATER PURIFICATION (See also Filters)

- *Wallace & Tiernan Co., Inc., Newark, N.J.
- Paragon Eng. Co., Arlington, N. J.
- R. U. V. Co., N. Y.

WATER PURIFICATION CHEMICALS

- Arnold Hoffman & Co., Inc., N. Y.
- E. I. Du Pont de Nemours & Co., Wilmington, Del.
- Electro Bleaching Gas Co., N. Y.
- General Chemical Co., N. Y.
- Hooker Electrochemical Co., N. Y.
- Mathieson Alkali Works, Inc., N. Y.
- Penna. Salt Mfg. Co., Philadelphia

WATER SOFTENERS

- Amer. Water Softener Co., Philadelphia.
- Cochrane Corp., Philadelphia.
- Graver Corp., E. Chicago, Ind.
- Int'l. Filter Co., Chicago
- Paramit Co., N. Y.
- W. B. Scifre & Sons, Pittsburgh, Pa.
- Wayne Tank & Pump Co., Ft. Wayne, Ind.

WATER WASTE DETECTION

- Empire Elec. & Water Co., Inc., N. Y.
- Pitometer Co., N. Y.
- Simplex Valve & Meter Co., Phila.

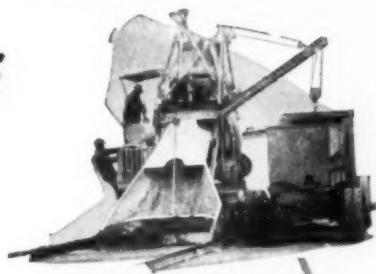
WATER WHEELS

- Allis-Chalmers Mfg. Co., Milwaukee.
- Wm. Cramp & Sons Ship & Eng. Bldg. Co., (I. P. Morris Dept.) Phila.
- J. Leffel & Co., Springfield, O.
- Newport News Shipbldg. & Dry Dock Co., Newport News, Va.
- Pelton Water Wheel Co., San Francisco.
- S. Morgan Smith Co., York, Pa.
- Worthington Pump & Mch'y. Corp., N.Y.

If you find any errors or omissions in this Where to Purchase list, please send corrections to
CONTRACTORS' & ENGINEERS' MONTHLY

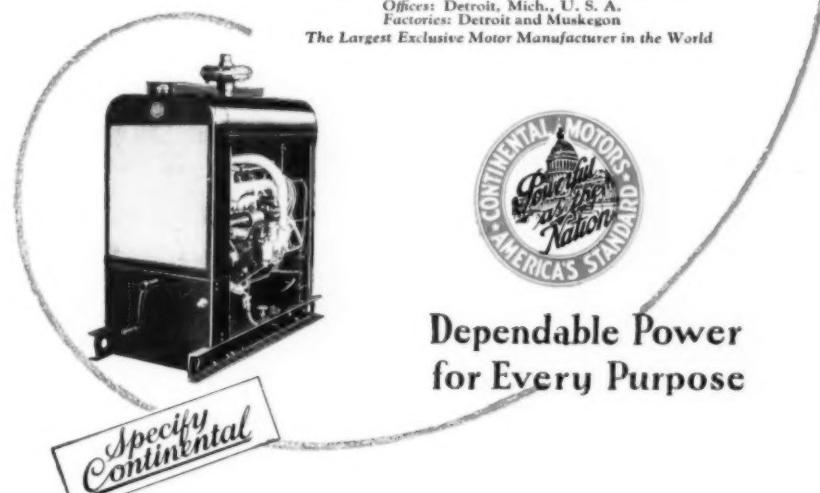
On The Basis Of Performance

Whether it be for oil wells or road building, mining or factory construction, the value of your gasoline power plant is based on performance. Red Seal Continental Motors give the certainty of economical performance, the full flow of power for daily or emergency needs which raise the production figures and increase profits. An experience of 26 years in motor building and 8100 trained specialists are two of the reasons for Continental superiority.



Foote 27-E Road Paver
powered with Continental
6-cylinder 8-B Red Seal
Engine.

CONTINENTAL MOTORS CORPORATION
Offices: Detroit, Mich., U. S. A.
Factories: Detroit and Muskegon
The Largest Exclusive Motor Manufacturer in the World



Dependable Power
for Every Purpose

Continental Motors

When writing to advertisers, please mention the Contractors' & Engineers' Monthly—Thank you.

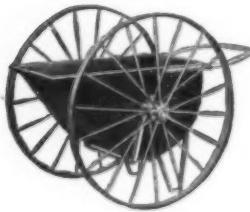


No. 4-A

**Contractor's
Barrow**

An excellent all-purpose barrow for general use. Shape and depth suitable for both dry and wet materials.

Other shapes and sizes in a complete range of models for concrete, coal, etc., as well as industrial public utility barrows.



Akron Carts

Six foot capacity, perfectly balanced. Underslung axle made of special alloy steel, heat treated. Renewable bushings on axle—the only cart with this desirable feature. New unbreakable hopper. 36 inch or 42 inch wheels.

THAT'S what you want in your wheelbarrows. That's what you are sure of in Akron equipment.

Akron Barrows are extra strong. Handles are hickory—the strongest wood there is. Axles are $\frac{3}{4}$ inch diameter—20% extra strength! Ten spoke wheels instead of eight. Heavy, stiff, riveted trays. Channel steel legs with wearing shoes—braced and riveted.

Work speeds up with Akron Barrows on the job because the men like them. Less dead weight pulling on the shoulders. Less tight rope balancing to keep the load steady. Easy to dump where the load is wanted. Plenty of leg room and the right width between the handles.

Akron Barrows are durable because in addition to their strength they stay together. Wheels are locked in place by cotter pins. The Channel steel legs and the channel shaped wheel brackets fit the grooves in the handles. Parts are riveted, wherever possible. Every bolt has a lock washer.

**THE AKRON
BARROW COMPANY**
3140 East 65th Street
CLEVELAND, OHIO

**Akron
Mortar Boxes**

Unbreakable corners—sides are folded around ends and then welded.

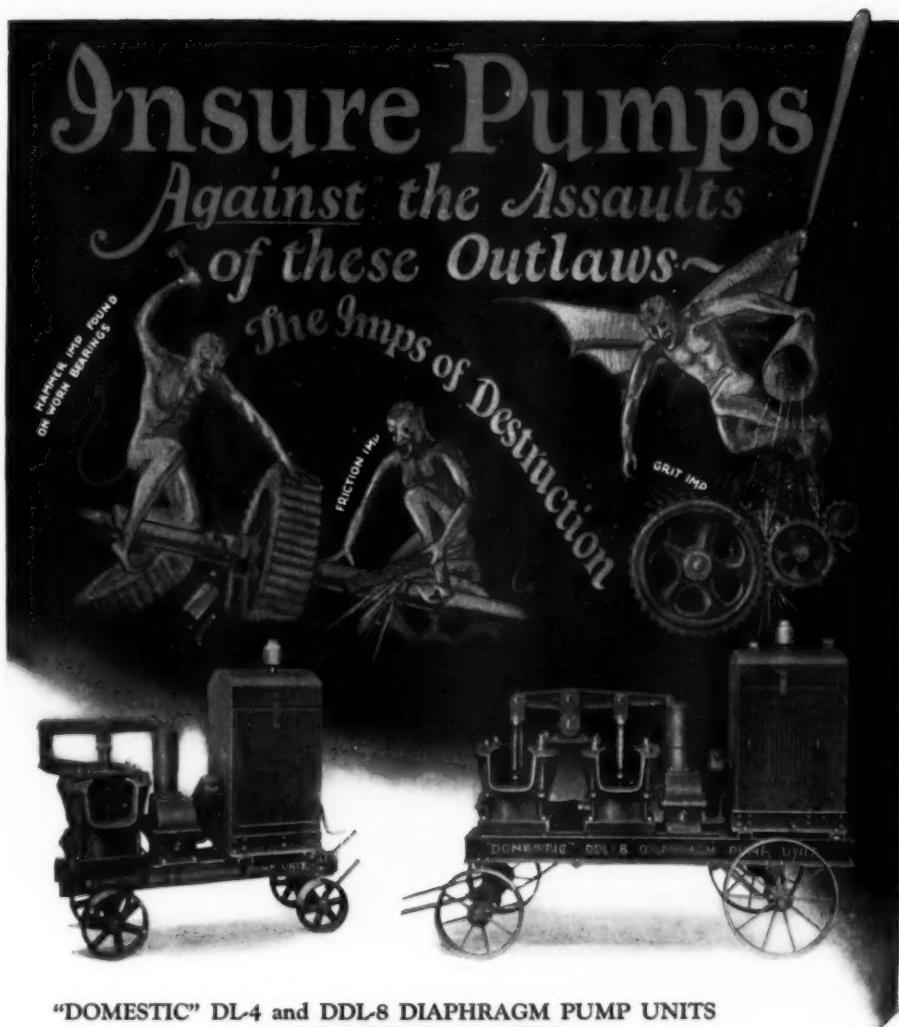
No seams or rivets inside the box to catch the hoe. Sloping ends, rounded at the bottom make mixing, emptying and cleaning easy. Heavy reinforcing angles around the top. Wide convenient handles.



**Akron
Knock-Down
Salamanders**

Heavy gauge sheets made in three sections with vertical flanges to hold shape and prevent bulging. Grate bars are wide for a hot, clean fire. Legs are channel steel. Pans and lids if desired. Knocked down and stored in an out of the way corner or set up in a jiffy.





**"DOMESTIC" DL-4 and DDL-8 DIAPHRAGM PUMP UNITS
ARE INSURED OUTFITS**

They have the power transmission gears and all bearings enclosed in dust-proof and oil-retaining housings and are automatically lubricated.

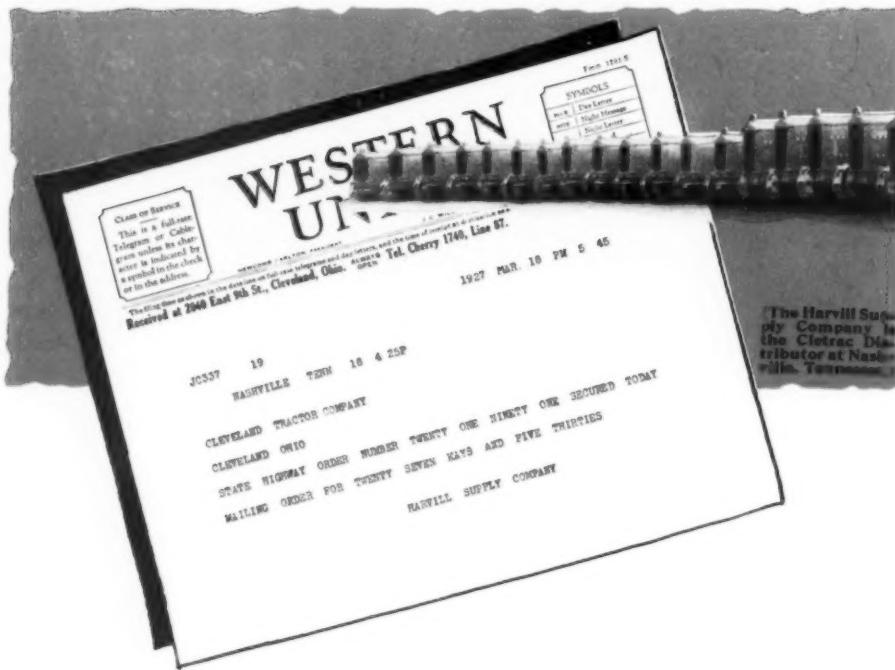
The Hyatt Roller Bearings used help reduce friction.

These Units are dewatering pumps of large capacity (8,000 to 24,000 gallons per hour) and have the very maximum suction lift.

They will give 24 hours a day service with the minimum of care, oil changed once a week, gas and water for the engine once or twice a day is about all the attention they require.

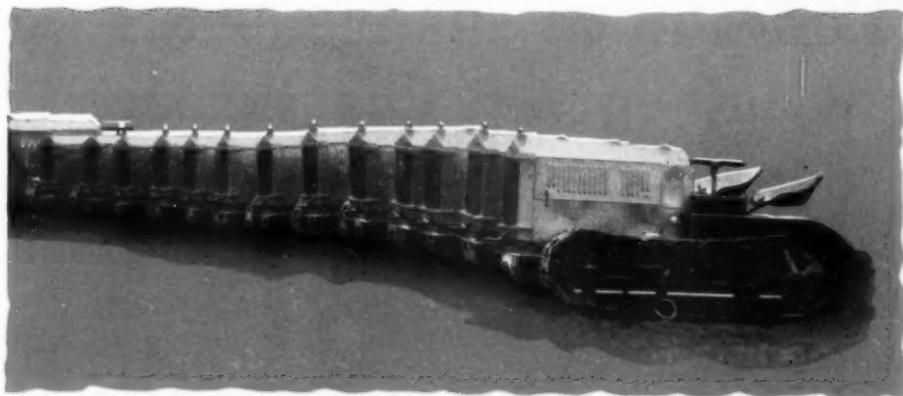
Domestic Engine & Pump Co.
SHIPPENSBURG, PA.
Manufacturers, for more than a decade, of
DEPENDABLE POWER UNITS for CONTRACTORS

Domestic
Engine & Pump Co.
SHIPPENSBURG, PA.
Established 1886
Manufacturers of
Dependable Power Units
for Contractors



Again this year Cletrac gets the order!

The above photograph shows Tennessee's twenty-nine new CLETRACS leaving the Cletrac factories, March 30, 1927



LAST year the Highway Department of Tennessee purchased twenty-two CLETRAC Crawler Tractors for its road construction and road-maintenance work. **This year twenty-nine more CLETRACS have been ordered** (five 30's and twenty-four 20's). This gives Tennessee a total of fifty-one "Crawler tractors of advanced design"!

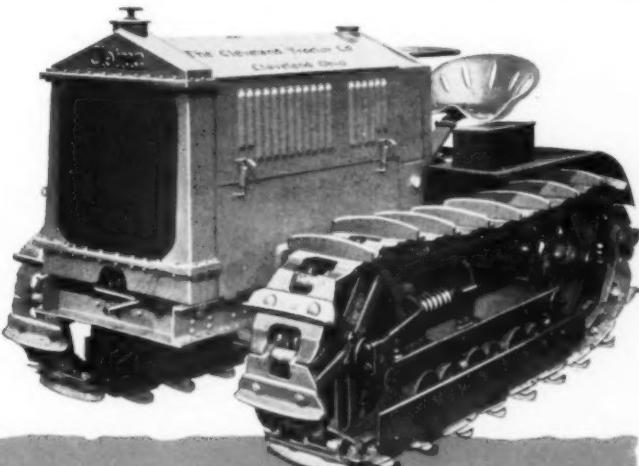
This is typical of the way all CLETRAC owners and operators turn again toward CLETRAC when they need additional tractors. Finer performance and an outstanding record of lowered costs have convinced them thoroughly that here is the greatest tractor value ever offered for the specific tasks of highway work.

Let us send you the full facts about CLETRACS—their ability to *outpull* any other tractors, pound for pound of weight—their *positive traction*—their *greater working speed*—their "One-Shot" lubrication! A post card will bring the complete story.

THE CLEVELAND TRACTOR CO., Cleveland, Ohio

Three Sizes

Cletrac 20K
Cletrac 30A
Cletrac 75



Times have changed—before the advent of The Perfected Utility the average Contractor had to be satisfied with such so-called half-yard machines then available—mostly “make-shifts” or poor “compromises.” But now—

—the consensus of opinion of some of the most prominent and exacting Contractors and Contractor's Equipment Distributors is that the GENERAL EXCAVATOR is the greatest step forward in the earth-moving Industry and the most remarkable Digging Tool ever created. Purchased by 95% of those discriminating excavating equipment Users who have inspected and investigated the machine and its Manufacturer. The result of more than thirty-five years continuous experience in the design and manufacture of Shovels and Cranes.

A REAL machine with a REAL purpose and built to give REAL service. Convertible in the field to Crane, Shovel, Dragline, Clamshell, Ditcher, Skimmer or Back-Filler.

Guaranteed against defects in material and workmanship for one year.

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Marion, Ohio, U. S. A. On Request



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This One Important Feature

and these—

Rugged boom swing from subgrade or platform.
Big spreading bucket.
Automatic measuring and self cleaning water tank.
Solid riveted unit frame—lowest overall height and width.
Power discharge unit foot-operated.
Self cleaning dependable tractions.
Fast mixing, fast discharging—a really cleaned drum.
Cut steel driving gears.
One-man control, fewest levers. Simple mechanism.
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Outside band type clutches and brakes easily repaired and adjusted.
47 H.P. Waukesha truck motor.
Enclosed cut gear reduction running in oil with plate type clutch.
Roomy skip—steep discharge angle.



LOW OVER-ALL HEIGHT

ENABLING this machine—superior as well in so many other ways—to move beneath viaducts and work in places of limited head-room, the low over-all height of the Smith 27-E Paver gives it distinct advantage.

This one important feature means that the speed and dependability of the Smith are available on jobs that the ordinary paver couldn't touch.

The rugged, compact simplicity of Smith design is a fundamental secret of its all-around efficiency—easy control—speed. It means fewer delays, fewer repairs, lower maintenance for the life of the machine. It means steady and profitable production on every job.

Study the features listed—and be sure to obtain your copy of Bulletin 409-F—full descriptive detail on the Smith 27-E Paver. Write today

The T. L. SMITH COMPANY

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Sales Offices and Service Stations in All Principal Cities

and this—

Instantaneous, central lubrication to bearing surfaces—now standard equipment on every Smith Paver. This centralized system, operated by a lever on the platform, enables the operator himself to do the same work which would take thirty men (oiling the bearings individually) a far longer time. A few seconds of foot-pressure on the lever—that's all that's required.



One Push—and the work of an hour is done

SMITH 27-E PAVER

SIX BAG

SMITH 27-E PAVER

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The Speedcrane, either on the job or in your yard, can be converted into a Shovel, Drag Line or Trench Hoe with a minimum of lost time, and the converted machine operates with as much speed as the Speedcrane itself.

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Speedcrane

CONVERTIBLE TO SPEEDSHOVEL—SPEEDDRAGLINE—SPEEDTRENCHOE

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Heltzel 80- and 110-Ton Trailer Bins Are Transported In Two Sections
Temporary Legs Are Removed After Erection

Heltzel Trailer Bins Are Erected In Hours Where Other Types Take Days



HELTZEL 80- and 110-ton Trailer Bins can be erected or dismantled in 3 hours—35- and 55-ton bins in much less time.

The larger bins are shipped to you in two sections with agrabatchers in position and are erected with a few large bolts.

HELTZEL 80- and 110-ton Twin Trailer Bins can be operated from the platform where the operator has full vision of his work or by lever from the ground. All **HELTZEL** Trailer Bins, 35, 55, 80 or 110-ton capacity are equipped with "one man" agrabatchers which measure by weight or by volume.

HELTZEL Measuring Agrabatchers are so designed that the turn of a single wheel control performs the complete operation of filling, cutting off, dumping the batch of sand and stone, opening the upper gates and closing the lower gates in less than 10 seconds. (A minimum of 6 batches per minute.)

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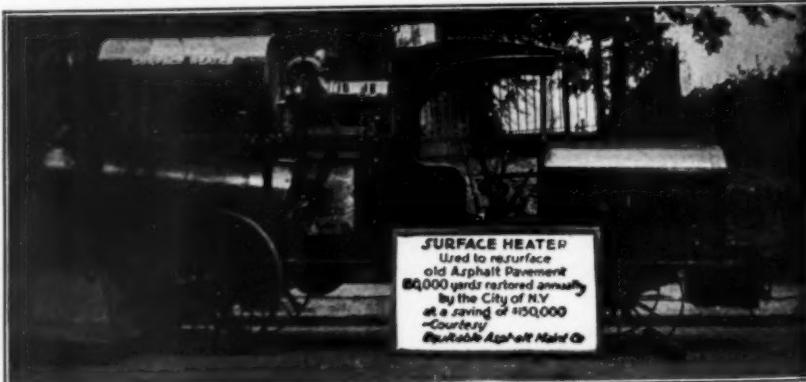
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EQUITABLE SURFACE HEATER

(Improved Lutz Surface Heater)

The new improved model is operated with a gasoline engine, designed for power at low speed. The change in this machine from steam to gasoline practically doubles its capacity, simplifies its operation, saves time and labor, permitting a more economical operation of the machine. It eliminates all dirt, water and steam and makes it possible to resurface without flame, from 1,500 to 2,000 sq. yds. of pavement in an eight-hour day. It is easy to start and operate and anyone that can operate an automobile can easily run this machine.

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KANSAS CITY, MISSOURI

Re-sale Proves Value of Telsmith Equipment

When ill health recently made it advisable for Frank Doherty, a veteran gravel man of Milwaukee, Wis., to retire from the gravel plant business, he found a ready sale for his Okauchee plant—designed and built for him in 1923 by Telsmith engineers—because his equipment was Telsmith.

The purchaser was the Waukesha Washed Sand & Gravel Co., successful operators of several gravel plants. Mr. George Brew, the General Manager, says: "I know Telsmith equipment. You can depend on it to give real service, year in and year out, without its costing you much for repairs. All of Mr. Doherty's equipment is in fine shape right now. The Telsmith men who laid out his plant certainly knew their business."

This equipment is pictured below: (A) Telsmith Plate Feeder, 24 in. x 5 ft.; (B) Telsmith

Belt Conveyor, 24 in. x 100 ft.; (C) Telsmith Arrowhead Grizzly; (D) Telsmith Primary Breaker, 10-in. opening, capacity 28-40 tons hourly; (E) No. 5 Telsmith Belt Elevator, 69-ft. centers; (F) Telsmith Washing Screen, 40 in. x 14 ft. long; (G) No. 7 Telsmith Sand Tank.

Telsmith Service is dependable. A single organization takes full responsibility, designs your plant and builds the machinery to fit your pit and your market. You pay only for results and Telsmith guarantees them. Bulletin No. GP-21, containing valuable information on gravel plant equipment mailed on request. No cost or obligation.

TELSMITH

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1820 Holton Street

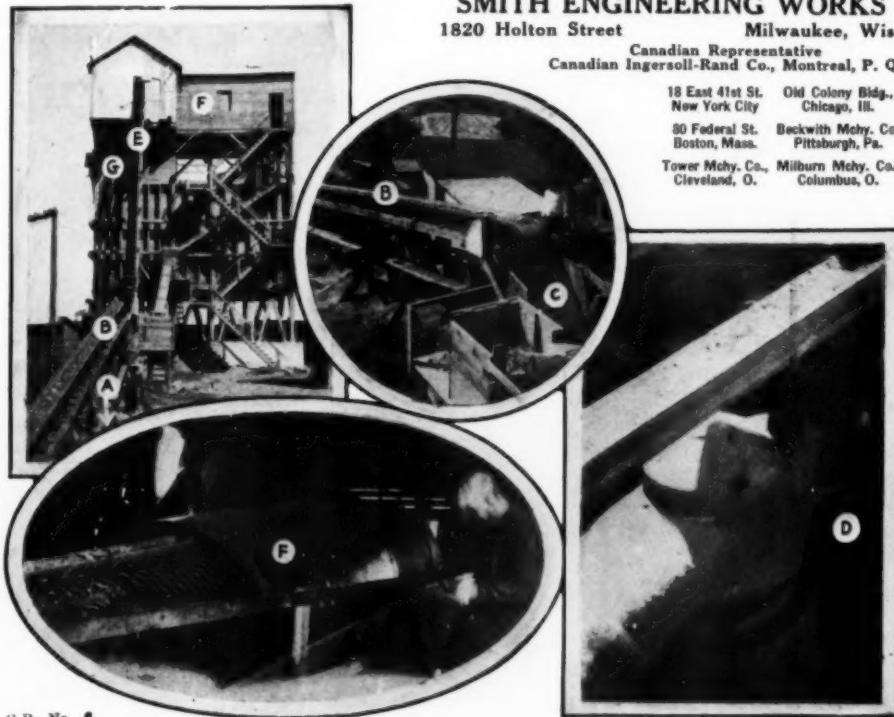
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THIS BULL FROG NO. 42 IS A TRIUMPH

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THE TOLEDO WHEELBARROW COMPANY

Toledo, Ohio

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Bull Frog barrows, carts,
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purpose in public work,
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Ready for the toughest job!

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Road Drags
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Pick out your nearest distributor. He knows how to give you service.



Built like a battleship—Lowest upkeep

STURDILY built for all types of road rolling work—the Good Roads Jr. Roller is the 1927 idea of a compact, easily handled roller that takes care of even the toughest jobs. In operation, the Good Roads Jr. Roller has proven its ability to stand the gaff under all conditions.

Easy to handle. Operation and upkeep costs low. Plus scarifying, grading and leveling features that make it one of the most economical of road-building machines.

With the Good Roads Jr., civic appropriations go twice as far.

Write for our latest catalog. Then arrange for a demonstration.

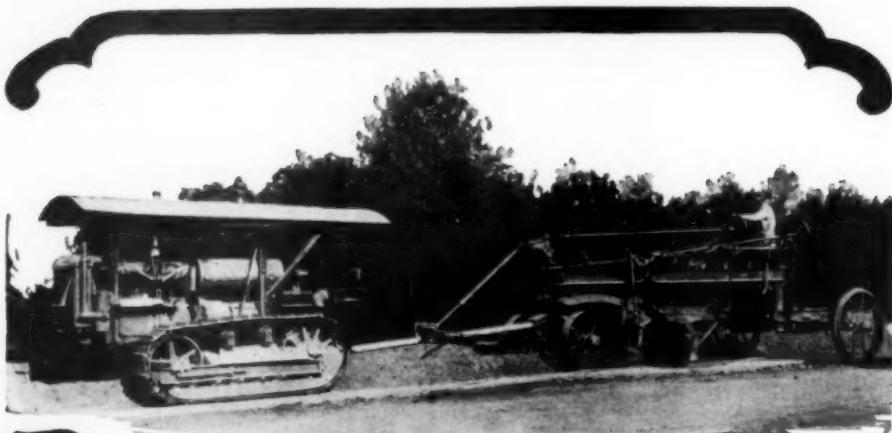
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Makers of the famous Good Roads Snow Plows

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Power in Reserve

TODAY a "Caterpillar" Tractor purrs smoothly along, pulling a giant grader through soft earth with nonchalant ease.

But tomorrow there may be slippery mud or stiff grades to conquer; tons of earth to move; trees to uproot; boulders to unseat; old pavement to shatter.

Then irresistible reserve power roars into action! Watch the "Caterpillar" thrust its sure-footed way through or over every obstacle! Watch it dig through — saving time and cutting costs.

Easy job or tough job—*Better, Quicker, Cheaper* with a "Caterpillar".

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Successor to

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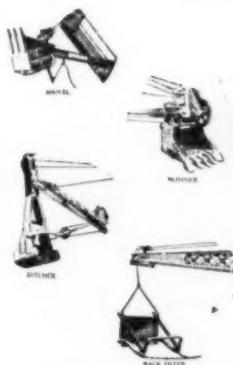
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a "Caterpillar"
Dealer near
You*

2027

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Bear Cat owned by E. P. Langenhan Co., Cleveland, working on Superior Ave. sewer extension job.



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Builders also of Byers Truckcrane
Sales and Service Throughout the Country.

THE purchase of a crane means several thousands of dollars invested—and if invested right, many more thousands returned to the owner.

No wonder it is made with careful consideration—and no wonder Byers Bear Cat is such an overwhelming first choice in its class. Here are a few of the reasons:

1. The Bear Cat is fast—the fastest operating Crane that we know of.
2. Low operating cost—strictly a one man machine.
3. Materials and construction equal to any machine made, regardless of price—better than most.
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6. An all around machine; handles interchangeable attachments with complete success.
7. Constantly in demand; used Bear Cats are snapped up quick.

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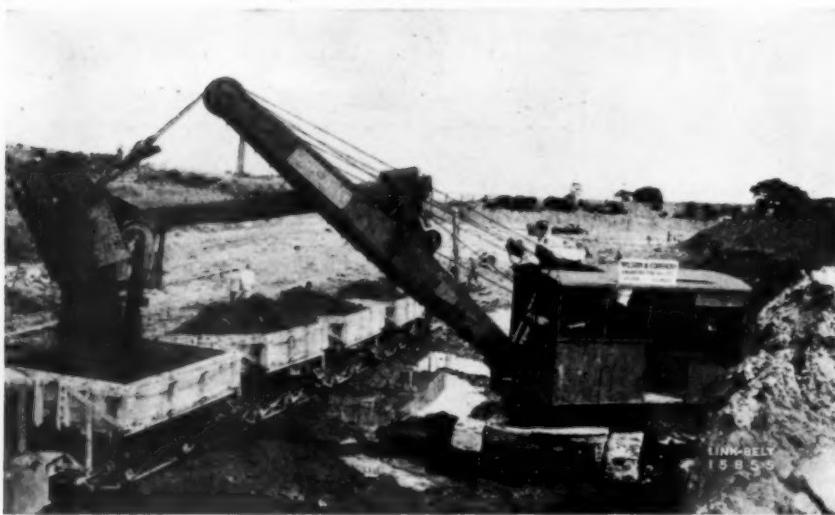
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BYERS BEAR CAT

THE ALL-PURPOSE ONE MAN CRANE-SHOVEL

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So Responsive to the Touch of the Operator—that it's “Almost Human”

THE operator can feel every movement of the Link-Belt Shovel—the control is entirely in the hands of the operator—and it's all in the clutch.

The clutch which must be operated thousands of times daily in any shovel must be constructed so that it is "instantly responsive" to the lightest touch of the finger to the lever—and then you should feel its action.

The clutch in a Link-Belt Shovel reacts direct from the hand lever in the cab "with-no-blind-spots," without going through any troublesome intermediate engaging mechanism.

Its engagement and disengagement is positive, and yet—all those little in-between movements so necessary to safe and speedy work are equally as positive.

When the clutches on a Link-Belt Shovel require adjustment—and they seldom do—you have only one point to adjust.

It has been truly said "it's a pleasure to run a Link-Belt Shovel." More of the reasons why will be cheerfully explained to you by the nearest Link-Belt representative—or if you prefer, write us to mail you "Crawler Facts."

Some territories still open for Agents. Get our proposition.

2963-C

LINK-BELT COMPANY

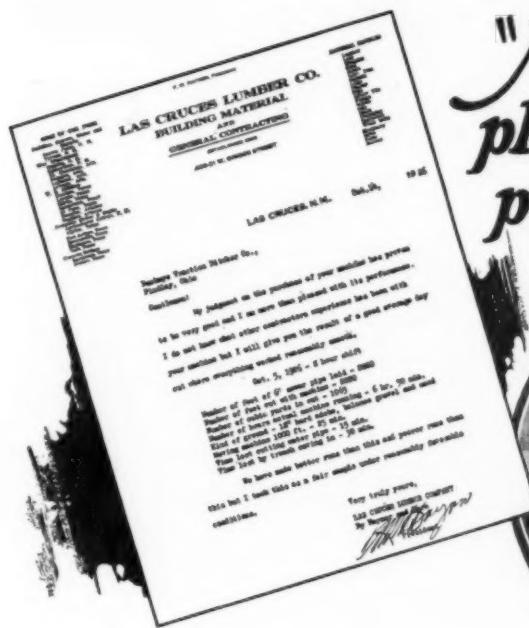
Leading manufacturers of Elevating, Conveying, and Power Transmission Machinery

CHICAGO, 300 W. Pershing Road

Offices in Principle Cities

LINK-BELT SHOVEL

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"More than pleased with its performance"



"My judgment on the purchase of your machine has proven to be very good and I am *more than pleased with its performance*."

This is the enthusiastic, unsolicited statement of F. M. Hayner, President of the Las Cruces (N. M.) Lumber Co., by Hayner and Burn, concerning their Buckeye after they had tested it thoroughly.

**Prompt
Shipment**

Truly, it's a mighty fine tribute. But Mr. Hayner does more than generalize—he gives actual details as the basis of his satisfaction. In 6 hours and 50 minutes, this Buckeye cut 2020 lineal feet (1065 yards) for 6-inch sewer pipe. The soil varied—18 inches being hard adobe, balance gravel and sand. He concludes by saying, "We have made better runs than this and poorer runs than this, but I took this as a fair sample under reasonably favorable conditions."

The Buckeye you need will give equally good service.

THE BUCKEYE TRACTION DITCHER CO.

Manufacturers of
**Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-
Line Trench Excavators, Tile and Open Ditchers, Backfillers, Pipe-
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There's a Buckeye Sales and Service Office near You

Buckeye ✓ TRENCH EXCAVATORS FOR OVER 30 YEARS

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THE INSLEY EXCAVATOR



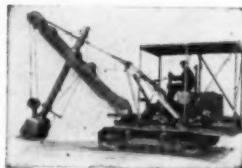
for SHOVEL - DITCHER - CRANE
SKIMMER AND DRAGLINE WORK

"Have Had It on Some Very Tough Jobs"

HERE it is on one of them. This Insley Excavator, owned by the Wickham Construction Company, has been taking things as they come in and around Cincinnati. Mr. Chas. W. Skinner, engineer of that company, reports that it has dug sewer trenches "through rock, hard pan, very stiff clay, gumbo and shale. Anything except solid rock in place can be handled with the machine with apparently no strain. . . . I have seen it move with apparent freedom over soft, wet, freshly filled ground on slopes of 10 to 30 per cent, where I was astonished at its agility."

The Insley Excavator has the power, speed and stamina to take jobs as they come along, no matter how tough or inaccessible they are. It does them economically, and makes money for its owner, wherever he puts it. There are hundreds of owners who will vouch for this fact.

Is the Insley a good investment? Look it over, then draw your own conclusions.



SHOVEL



SKIMMER



DRAGLINE

Low First Cost

**Low Operating
Cost**

**Write for
Catalog No. 51**

INSLEY MANUFACTURING COMPANY - Indianapolis

NO. 516
**ENGINEERS
AND
MANUFACTURERS**

CURTIS COMPRESSORS, HOISTS, CRANES, CAR WASH SYSTEMS, PORTABLE COMPRESSOR UNITS

On what kind of work, moving or stationary, could you fail to SAVE MONEY with Curtis Compressor units?

The extreme mobility of the Curtis Compressor, powered and propelled by Fordson, is so apparent that some contractors overlook the fact that it will save them much money, even when portability is not an important factor in the particular class of work they do.

Compared with any other type of unit, the Curtis will often save you hundreds of dollars, both on first cost and on operating cost. This wonderfully useful outfit takes advantage of the manufacturing economies of two highly standardized units produced in quantity by large, thoroughly established companies.

Curtis engineers have combined these two units into one quickly coupled and well co-ordinated unit. Low fuel cost through the use of kerosene; low maintenance cost through having only one double purpose engine to keep in repair; the lack of necessity for skilled men for

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Through several years of successful use, the Curtis Portable Compressor has established itself as the one most satisfactory unit on all types of work. Contractors find they can *standardize* on it to the exclusion of other types. Its advantages should be thoroughly investigated before any compressor equipment is purchased.

**List Price,
Curtis Unit Only \$300
(STEEL TIRED)**

\$300
SUBJECT TO DISCOUNT

MAIL COUPON TODAY	
CURTIS Pneumatic Machinery Co. 1931 Kienlen Ave., St. Louis Branch Office, 328-1 Hudson Terminal, N. Y.	
Gentlemen: Please send at once full information about the Curtis Portable Compressor, powered and pro- pelled by Fordsontractor. I prefer to deal through [dealer].	
Name _____	Address _____
Write character of work in margin or by letter.	

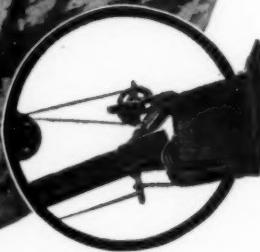
**Both powerful and
propelled by
Fordson Tractor**

CURTIS COMPRESSOR

PORTABLE

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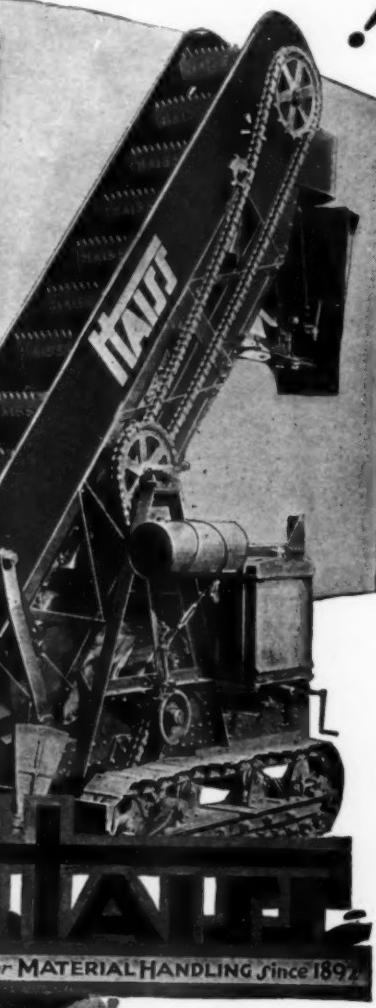
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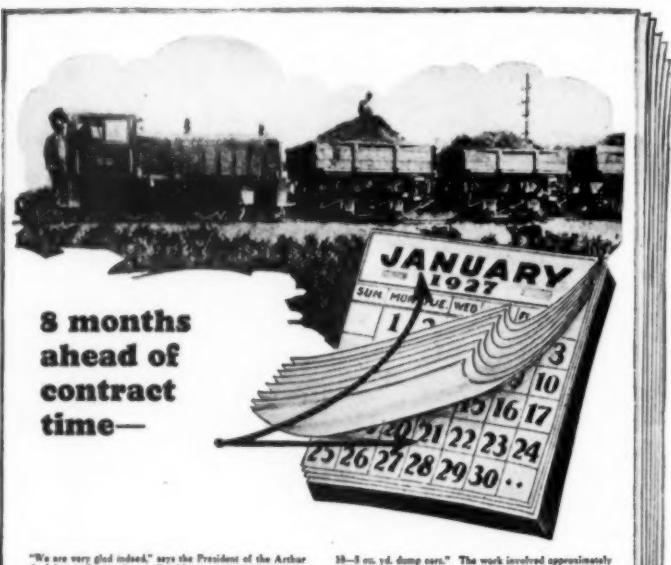
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Vol. XIV

No. 5

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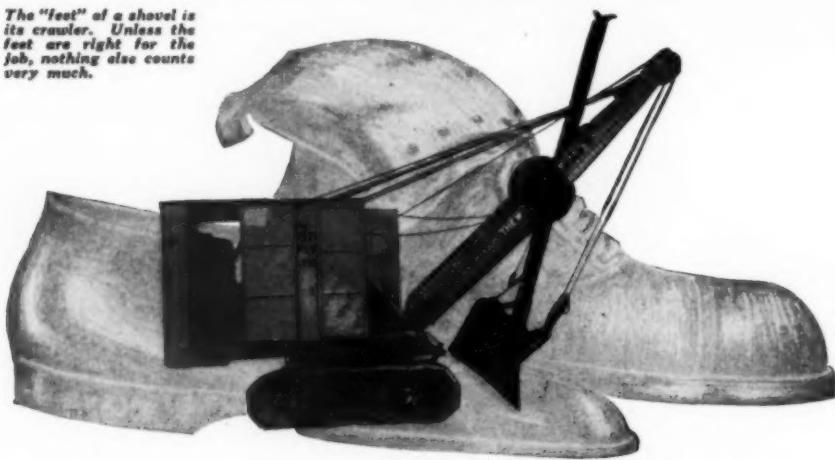
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The "feet" of a shovel is its crawler. Unless the feet are right for the job, nothing else counts very much.



A Question of FEET!

ISN'T this true?—don't most of the important shutdowns and repairs on the machines you operate arise from troubles connected with the crawler mechanism? If your crawlers would stay steadily on the job, wouldn't you have a decidedly bigger profit to pocket at the end of every year?

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Vol. XIV
No. 5

Contractors' *and* Engineers' Monthly

May,
1927

The Design of Sand and Gravel Plants

By FRANK M. WELCH

Chief Engineer, Greenville Gravel Corporation, Greenville, Ohio

COMPARATIVELY speaking, it has been but few years since the gravel industry emerged from the experimental stage. Not long ago, the average engineer and architect, because of his limited knowledge and the lack of stability in the gravel business, invariably specified crushed stone. Although increased usefulness and added merits of gravel aggregate are constantly being developed, the era of guesswork has long since ended, and the production of gravel has become one of the basic industries. Each year it is taking a more prominent position in the front rank.

**STANDARD SAND AND
GRAVEL PLANT OF THE
ROQUEMORE GRAVEL
COMPANY, MONTGOMERY,
ALABAMA**

This plant, designed by the F. M. Welch Engineering Service, was the largest sand and gravel plant in the world when it was built, producing over 200 railroad cars of material in twelve hours. Over the third railroad track is seen the large stationary-type settling tanks. The men operating the tank are seen standing on the walk around the tank

where we must not and need not experiment to any great degree either in the production of our material or in the construction and design of our plants.

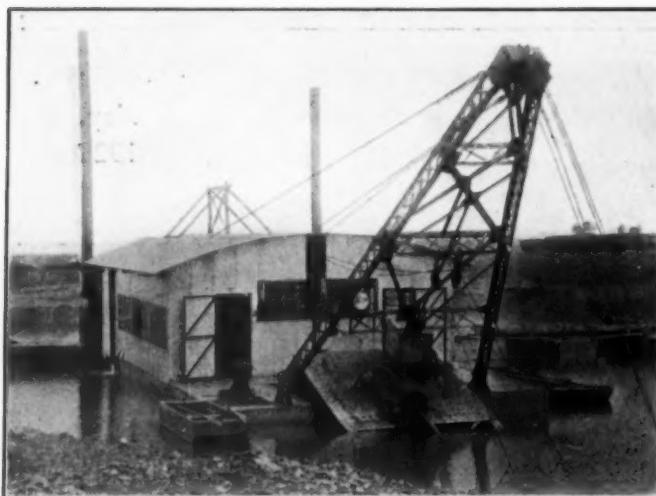
I have received many inquiries in years past from landowners who have found some gravel on their farms, and who ask, "How much does a gravel plant cost?" Rather a broad subject to answer! When I was with the Webster Manufacturing Co., I got up a printed questionnaire which I sent out in reply to such vague inquiries. If two-thirds of these questions were fully answered, I was much better



The results of the proven reliability and superiority of our products are the hundreds of important concrete structures which have been and are being built throughout the country with gravel aggregate. When, after careful study by the most outstanding engineers, gravel aggregate is used in the construction of such engineering monuments as the Big Four bridge at Sidney, Ohio, the new union station at Cleveland, the A. I. U. building at Columbus, and the new Book Tower Building in Detroit, which will be the tallest building in the world, we are at once reminded of the grave responsibility with which we producers are confronted. Our industry has arrived at a point

prepared to give an intelligent estimate regarding the probable cost of their proposed plant, or else to advise them to invest their money some other way. During my later years, since associating with the Greenville Gravel Corporation, and since I have embarked as a consulting engineer, it seems to me that I have either been catering to a more intelligent clientele, or else the general public has begun to realize that there is no such thing as a "hand-me-down" sand and gravel plant.

People have learned that there are so many prevailing conditions, such as the nature of the deposit, topography of the property, shipping facilities, market requirements, proximity to



PUMP BOAT OR DREDGE
USED BY THE GREEN-
VILLE GRAVEL CORPO-
RATION AT ITS URBANA,
COLUMBUS, MASSILLON,
AND FORT JEFFERSON,
OHIO, PLANTS, AND
ALSO AT BRIGHTON,
MICH., AND LOGANS-
PORT, IND.

It is such methods of ex-
cavating as this that justify
the use of the skip hoist for
elevating the wet material
to the top of the plant

market, competition, and so forth, which govern the type and design of every link in the operation, that such a thing as a standard design is not practical.

Plants Seldom Duplicates in Design

In the dozen or so plants of the Greenville Gravel Corporation one would think that at least two of them would be duplicates. They are not. Each plant is designed to fit all the conditions at hand. It is true that there are certain mechanical units and parts of units which are standard and which enable us to keep standard repair parts on hand at our main shops in Greenville. Even were the environments identical at two of our deposits where plants were to be constructed, unless both plants were built the same year, the varying markets and the constant development of better methods would doubtless alter at least several of the respective details in the two plants. Bearing in mind all the gravel plants in the design of which I have collaborated, including those of our own organization, those which our consulting engineering department has piloted, and those which I built before coming to Greenville, I have yet to find an instance where the drawings for one successful plant were suitable for another.

I am going to discuss only the design of the plant proper. We ordinarily consider that the plant proper starts at the receiving hopper at the foot of the belt-conveyor, elevator, or whatever unit is employed to raise the raw material to the top of the building, and that it ends at the loading gates.

Feeders

Feeders, as you know, are used for maintaining a uniform and constant flow of raw material onto the conveyors or elevators from the receiving hopper. In the early days of our industry, the more progressive operators who were constantly on the lookout for labor-saving devices, such as automatic feeders between their receiving hoppers and conveyors, tended to follow the standard practices successfully used in the coal fields. Therefore, the earliest attempts to eliminate the necessity of a man at the hopper gate consisted of the reciprocating feeder which proved to be a step in the right direction. The next advancement was the steel apron feeder, which produced a somewhat more continuous flow than did the reciprocating outfit. Both of these units worked successfully in gravel, as they did in coal, but, unlike the coal, the gravel and sand ground them out rapidly. A plant with a fair annual production would wear out either of these types in a season. We finally developed the rotary feeder, which cost less money in the first place, lasted several years, required less horsepower, produced a uniform feed, and in general proved to be the final answer. This, like the other types of feeders, drives from the foot shaft of the conveyor or elevator.

Elevating Material to Plant

The next step in the flow sheet, that of elevating the raw material to the top of the plant, has produced some interesting problems during the last few years. This has been especially true where the deposit lay all or partly under water, and pump boats were used for excavating. It

was soon found inefficient to pump the material all the way to the top of the plant except on very low and limited operations. It was further found necessary, in order to elevate the wet material on a belt-conveyor, to install the conveyor at a much flatter slope, which meant lengthening it considerably. Even then, if much water remained in the sand and gravel, the speed of the conveyor had to be nearly doubled to properly retain the material. Likewise, the bucket elevator showed excessive wear and tear if working in water, even when a very expensive type chain was used.

Our management conceived the idea of elevating wet material to the top of the plant with a balanced skip hoist. Knowing that such equipment was used extensively and successfully in the mining fields and at blast furnaces, we consulted concerns and engineers experienced in skip hoist designs. We requested estimates on complete units to suit our requirements, but in spite of all we could do, these estimates persisted in hovering around \$30,000 to \$40,000. As such a figure was prohibitive, and realizing that a couple of 5-ton steel cars or skips could be built and hauled up and down an incline for less money than that, we timidly set out to design our own skip hoists.

We built the first one at a cost not much different from the cost of a belt-conveyor with its drive and trestle, to do the same amount of work. When it was completed we warned everybody to stand back, turned on the juice and threw in the switch for the first time. It worked. Aside from a few minor perfections, the several skip hoists that we have since installed are just like the first one.

We had purchased automatic electric track-limit switches to insure against the skips not stopping at the top just when they should, or in other words, to eliminate partly the personal equation of the operator. Somehow, in the first couple of installations, there was no room to

install these safety devices and they were left out. However, since one of our 5-ton skip cars landed over in the middle of a plant on top of a screen, we have found or made room for the track-limit switches.

The skip hoist compares very favorably with the belt-conveyor operation handling an equal tonnage. It requires a larger motor, but the load is intermittent, leaving the power bill about the same. It requires one more man to operate than does the belt-conveyor, but this is counteracted by the low maintenance cost. The first cost is not much different. One of our district plant managers, who has had plenty of experience with both, states that whether it is required for wet material or for handling dry material from a steam-shovel, he would as lief, if not prefer to, use the skip hoist for the initial elevating unit rather than the tried and true belt-conveyor.

Location of Crushing Equipment

At this point in our flow of material, the question arises as to the best location of the crushing equipment, if any is required. Some operators prefer to complete their scalping and crushing before elevating the whole to the top of their plant where the final screening is done. Their reason for this course is that it eliminates the elevating of their oversize material twice. I think there are the three following arguments which considerably offset the above reasoning:

1. While the double elevating of the coarse product is being only partially eliminated, a double elevation of a distance about equal to the height of the crusher house is required of all the sand and marketable gravel.
2. It is less expensive to build the crusher room as part of the main plant than it is to erect a separate building for the purpose.
3. The separate crushing unit precludes the possibility of selling any separate crushed ma-

**MODERN GRAVEL PLANT
OF THE INTERSTATE
SAND AND GRAVEL COMPANY, COVINGTON, IND.**

This plant was designed and built by the F. M. Welch Engineering Service two or three years ago, and illustrates very well the type of plants so designed that crushing is done on the ground before the material is elevated to the main screening plant over the bins. Note that the crusher house is located in the center of the elevating system. The plant is well housed and shows the modern type of bins built over the rail-road tracks, as well as the I-beam trolley projecting over the doorway leading into the plant.



terial, without involving additional and costly loading facilities.

There are other technical reasons why it is more economical from both the standpoint of first cost and of daily operation to carry all the material to the top of the main plant with the initial elevation and before any crushing is done. All our operations are constructed in this way. At one or two of our plants, however, where boulders of considerable size in large quantities occur in the deposits, we have installed a large low type of jaw crusher, adjacent to the receiving hopper and directly over the belt-conveyor. The top of this crusher is slightly lower than the top of the receiving hopper. Boulders, which are too large to pass the rail grizzly on top of the hopper, can readily be pushed into this crusher by the man who dumps the pit cars. This process is greatly facilitated by sloping the hopper grizzly bars slightly toward this crusher or breaker. The unit is really a preliminary breaker, which merely serves to crack the larger boulders before dropping them on the conveyor belt.

Screen

Now that we have our raw material safely in the top of our plant, what are we going to do with it? The answer depends considerably on what our biggest customers want us to produce. We cannot cater to the whim of every indiscriminate user of gravel and sand that comes along and yet we can arrange our screens to permit a flexibility of production which will accommodate a greater variety of specifications. I am not going to dwell upon the superiority of various types of screens but I will tell you of some of the principles which our organization has quite successfully followed.

We of course wash our material first and re-wash or rinse it while screening. Our oversize passes down to crushers on concrete foundations below and is re-elevated for further screening. Our screening process is in some respects the same as followed by most producers, but in some respects it is quite different from many.

When the various grades of material roll from our different perforations, they all come from the screen at about the same point instead of at remote points. In other words, the various sizes are so close together in adjacent steel spouts as they come from our triple-jacketed screens, that by the manipulation of butterfly valves any mixture in any proportion can be produced. Furthermore, we find that this process very thoroughly mixes the aggregates. It also permits the man in the screen house to watch the products and keep the mixtures uniform regardless of variations in the pit.

Sand-Settling Tanks

The choice of sand-settling tanks varies a good deal according to the percentage of sand, market requirements and personal preferences. The automatic type, the hand-operated stationary kind, and the mechanically driven tanks all serve their intended purposes or they do not remain long. The mechanically driven tanks, that is, the tanks made long and narrow with the bottoms sloping upwards to above the water level, where the sand is dragged out by a flight or drag conveyor, is becoming quite popular in the larger cities. This is because these machines so thoroughly dewater the sand that delivery trucks do not violate the city ordinances by dripping water on the public streets.

Power

Regarding power, we are now driving all of our operations electrically, purchasing our power from central plants. We have found it most satisfactory to drive each unit in our installations with a separate motor, with the exception of the crushers. By driving all the crushers from a common-line shaft we can drive, say, three crushers requiring 50 H. P. each with a 100 H. P. motor. This is possible because seldom are all the crushers handling their maximum load at the same time.

Washing Water

About the only feature which we have left untouched in the screen house on top of the plant is the subject of washing water. We all have our different problems to solve in the matter of supply and application of water and the solutions must be worked out to suit each operation.

Bins

Passing on from the washing, screening, and crushing operations, the question of type, size, and arrangement of bins underneath the screens opens up an array of designs. To start with, some operators prefer side-loading bins, whereas others pass their railroad cars or trucks underneath. In our plants, we do all our loading underneath because this method reduces the total height of bins having the same capacity. Also, this method permits the use of three or four loading tracks and more flexibility in the machinery layout above. There is scarcely any difference in the respective costs of the two types and the only argument against the overhead bins is the greater leakage of water through closed gates into the cars and tracks below. However, if the washing water is properly distributed in the screens above there is very little water leakage through the gates except under the sand bins.

Some operators feel that putting in three or four loading tracks is an unnecessary added expense. If you will consider that you must have so much track-storage room for your empty and loaded cars, and that you must build a grade for these tracks, you will find that you can build your total length of track required cheaper side by side than by stringing it out half a mile or more. For a plant of any size at all, the loading is greatly facilitated if three or four loading tracks are available, and a plant so constructed permits of considerable more flexibility in the arrangement of the machinery above the bins and in the flow and handling of various grades of material.

Our company has adhered to the policy of little or no bin storage. Outside of one plant which we built during the extreme car-shortage period caused by the war, our plants are all

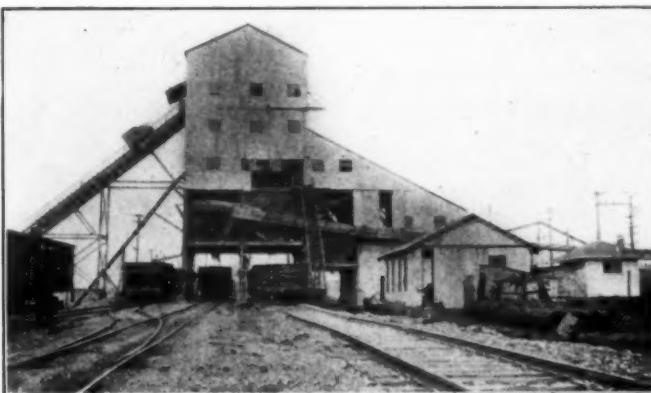
concrete, we are getting into a subject whose merits depend greatly on the locality, type of plant and the probable life of the deposit. However, when large storage bins are required, I know of no more commendable way to advertise the fact that we are manufacturers of concrete aggregate than to build our bins of concrete. The circular type of concrete bin can be built very economically from standard steel forms and can be arranged for very efficient loading. Our own recent plants, all being of the more skeleton type of design, with little or no storage, are of structural steel on heavy concrete footings.

Housing the Plant

After the features which have now been discussed are weighed and the most suitable

PLANT OF THE GREENVILLE GRAVEL CORPORATION, OF GREENVILLE, OHIO, AT COLUMBUS, OHIO

This plant uses a skip hoist for elevating the material to the top of the plant. All material is raised to the top of the plant before any crushing is done. The low part of the building to the right and connected to the main plant is the crusher house where the oversize material is dropped from the main screens into crushers and re-elevated by means of the large bucket-elevator back to the top of the screening plant over the bins.



designed to load our main commodities, such as railroad ballast, concrete pebbles, concrete mix, sand, and so forth, direct into cars from our screens. Of course we have small bins of enough capacity to permit the shifting of cars and we usually have about two bins which hold a car and a half apiece.

When speaking from our general standpoint, however, I am considering conditions entirely different from an operation located within or near the limits of a large city, where all or a large part of the shipments are by trucks. Such a plant caters to both wholesale and retail trade and must be equipped with extensive storage facilities such as retail trade demands. The larger the bins, the better equipped they are to serve the truck trade without delays.

Wood, Steel, or Concrete for Plant Construction

Regarding the question as to whether a plant should be constructed of wood, steel, or con-

crete, we are getting into a subject whose merits depend greatly on the locality, type of plant and the probable life of the deposit. However, when large storage bins are required, I know of no more commendable way to advertise the fact that we are manufacturers of concrete aggregate than to build our bins of concrete. The circular type of concrete bin can be built very economically from standard steel forms and can be arranged for very efficient loading. Our own recent plants, all being of the more skeleton type of design, with little or no storage, are of structural steel on heavy concrete footings.

ACKNOWLEDGMENT.—From an address delivered at the Eleventh Annual Convention of the National Sand and Gravel Association.

Progress of Legislation for Workmen's Compensation

Abstract of Bulletin No. 423 of Bureau of Labor Statistics

THE first state legislation in the United States providing for stated benefits without suit and without proof of negligence was a cooperative insurance law of the state of Maryland, enacted in 1902. This law was of restricted application, affecting only mining, quarrying, steam and street railways and work by municipalities in constructing any sewer, excavation or other physical structure. This law was to be administered by the State Insurance Commissioner and made payment an absolute requirement in case of death. It was declared unconstitutional after about two years of operation. An act of the same Legislature made quite similar provisions for coal and clay miners in Allegany and Garrett Counties.

The next law within the territorial jurisdiction of the United States was an enactment by the United States Philippine Commission in 1905, authorizing the continuance of wages for a period during disability, but not exceeding ninety days, in case of injury received by employees of the insular government in the line of duty.

Next in order of time was the Montana statute of March 4, 1909, in effect October 1, 1910, providing for the maintenance of a state cooperative insurance fund for miners and laborers in and about the coal mines of the state. Contribution to the fund was compulsory. Employers paid on the basis of the tonnage mined and employees on the basis of their monthly gross earnings. State officials were to administer the fund, and payments for death and disability were provided for. While compulsory, the act was not exclusive as against injured workmen, who were permitted to sue under the Employers' Liability Law, though bringing suit forfeited benefits under this act. The double obligation imposed upon the employer by the act was held by the Supreme Court of the state to invalidate it, though in its essential features it was held to be a valid exercise of the law-making power.

The next law enacted in this field, and the last before the effect of investigations by commissions came to be influential, was the law of 1910 of Maryland, superseding and repealing the act of 1902, affecting the coal and clay miners of Allegany and Garrett Counties. It provided for equal contributions by employers and workmen to a fund to be collected and dispersed by the treasurers of the respective counties. Administration rested with the county commissioners. Suit could be brought, but this

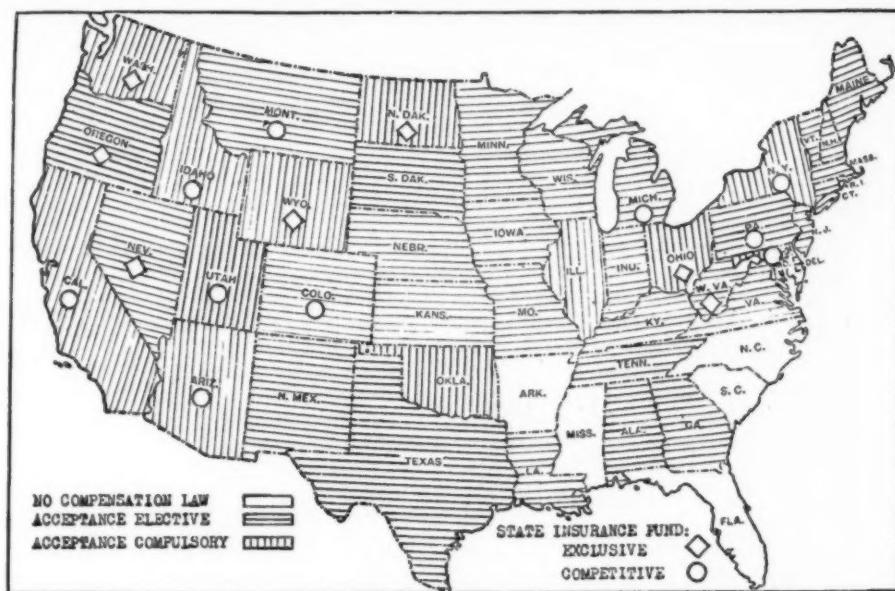
barred compensation rights and, conversely, the acceptance of benefits barred the right to sue. The fault of double liability, which was held to invalidate the Montana statute, was avoided in this law by a provision which authorized an employer who had defended a suit and against whom judgment had been rendered, to deduct, on compliance with certain conditions, the amount of such judgments and costs from the payments thereafter to be made by him to the county fund.

It is to be observed that the foregoing legislation, antedating what may be called the commission period, is of limited application both as to the locality and the classes of employees affected, and also that there appears to have been little regard for compensation principles as at present understood. The remaining laws to be noted may be said to be of general application and have either followed the investigations of commissions or have been enacted under conditions making the results of such commissions available to those interested.

The first of the laws of this class is the elective compensation law of New York, 1910, followed at the same session by a compulsory law for hazardous occupations. The latter law was declared unconstitutional after a very brief term of existence, but after an amendment to the constitution, a new law was passed which has been sustained by both the state and the Federal courts.

Rapid Progress from 1911-1927

Of the ten laws enacted in 1911, seven provided for simple compensation, three containing also provisions for insurance, while in 1912 three states enacted compensation laws and one an insurance law; in 1913 seven states were added to the list, in five of which only compensation was provided for while in two there is also a system of insurance. In 1914 compensation laws were enacted in two states, though in one, Kentucky, the law was declared unconstitutional before the time for it to take effect. Of the ten new laws enacted in 1915 (one taking the place of the unconstitutional statute of Montana), nine provided for compensation merely, while one established an insurance system. A new compensation law was passed in Kentucky in 1916, in lieu of the earlier law declared unconstitutional. This, and a law of Porto Rico which requires the insurance of the liabilities fixed by it, are the only new laws of that year, though important amendments



MAP SHOWING EXTENT OF COMPENSATION LAWS IN THE VARIOUS STATES

were made in Louisiana and New York. Indeed, practically every year is marked by amendments whose tendency is in general to strengthen the laws and enlarge their scope.

The extension of compensation legislation to five additional states in 1917, one in 1918, four in 1919, besides the inclusion of public employees in the District of Columbia, and one in 1920, marks the present bounds of compensation legislation. Of these, two of the laws of 1918, one in 1919 and the Arizona law of 1925 provide for a state insurance system, though in only one of them is this system exclusive. The Missouri enactment of 1919 was rejected by a referendum vote as was one of 1923. A new enactment of 1925 was voted on in November, 1926, and sustained, coming into effect as to compensation on January 9, 1927.

The following table shows in chronological order the states and territorial jurisdictions that have enacted compensation laws:

	Approved	Effective
U. S. ¹	May 30, 1908	Aug. 1, 1908
Wash.	March 14, 1911	Oct. 1, 1911
Kans.	March 14, 1911	Jan. 1, 1912
Nev.	March 24, 1911	July 1, 1911
N. J.	April 4, 1911	July 4, 1911
Calif.	April 8, 1911	Sept. 1, 1911
N. H.	April 15, 1911	Jan. 1, 1912
Wis.	May 3, 1911	May 3, 1911
Ill.	June 10, 1911	May 1, 1912
Ohio	June 15, 1911	Jan. 1, 1912
Mass.	July 28, 1911	July 1, 1912
Mich.	March 20, 1912	Sept. 1, 1912
R. I.	April 29, 1912	Oct. 1, 1912
Ariz.	June 8, 1912	Sept. 1, 1912
W. Va.	Feb. 22, 1913	Oct. 1, 1913

Ore.	Feb. 25, 1913	July 1, 1914
Texas	April 16, 1913	Sept. 1, 1913
Iowa	April 18, 1913	July 1, 1914
Nebr.	April 21, 1913	July 17, 1913
Minn.	April 24, 1913	Oct. 1, 1913
Conn.	May 29, 1913	Jan. 1, 1914
N. Y. ²	Dec. 16, 1913	July 1, 1914
Md.	April 16, 1914	Nov. 1, 1914
La.	June 18, 1914	Jan. 1, 1915
Wyo.	Feb. 27, 1915	April 1, 1915
Ind.	March 8, 1915	Sept. 1, 1915
Mont. ²	March 8, 1915	July 1, 1915
Okl.	March 22, 1915	Sept. 1, 1915
Vt.	April 1, 1915	July 1, 1915
Maine	April 1, 1915	Jan. 1, 1916
Colo.	April 10, 1915	Aug. 1, 1915
Hawaii	April 28, 1915	July 1, 1915
Alaska	April 29, 1915	July 28, 1915
Pa.	June 2, 1915	Jan. 1, 1916
Ky. ³	March 23, 1916	Aug. 1, 1916
Porto Rico	April 13, 1916	July 1, 1916
S. D.	March 10, 1917	June 1, 1917
N. Mex.	March 13, 1917	June 5, 1917
Utah	March 15, 1917	July 1, 1917
Idaho	March 16, 1917	Jan. 1, 1918
Del.	April 2, 1917	Jan. 1, 1918
Va.	March 21, 1918	Jan. 1, 1919
N. D.	March 5, 1919	July 1, 1919
Tenn.	April 15, 1919	July 1, 1919
D. C. ¹	July 11, 1919	July 1, 1919
Ala.	Aug. 23, 1919	Jan. 1, 1920
Ga.	Aug. 17, 1920	March 1, 1921
Mo. ²	April 30, 1925	Nov. 16, 1926

¹ Public employees only² Earlier laws of Montana (1909), New York (1910), and Kentucky (1914) were declared unconstitutional.³ The law of Missouri was suspended awaiting the results of a referendum.

The dates given above are the dates of the actual inception of compensation methods in the various jurisdictions. As indicated by the footnotes, earlier laws were enacted in a few states, but were never really operative. In a number of jurisdictions the existing laws widely differ from those enacted at the dates given above,

but the operation of a compensation law has been continuous since the original act became effective. There are, therefore, but five states in the southeastern portion of the Union that are at present without compensation laws. Also, it rests with Congress to provide for private employees in the District of Columbia and for interstate employees in transportation and for maritime workers. The "Longshoremen's and Harbor Workers' Act," passed by the Senate June 3, 1926, became a law on March 4, 1927.

State Constitutional Provisions Aiding Legislation

Besides the statutory enactments noted above, there have been constitutional provisions made in a number of states, adopted with a view to the removal or forestalling of objections to compensation legislation on grounds of constitutionality. Thus, the constitution of Arizona, adopted on the admission of that state into the Union in 1912, and amended in 1925, provides specifically for the enactment of a compensation law. Amendments in favor of such legislation were adopted in 1911 in California, in 1912 in Ohio and amended in 1923, in 1913 in New York and Vermont, in 1914 in Wyoming, and in 1915 in Pennsylvania. In Oklahoma alone, of all the states where the question has been submitted to the people, was such an amendment rejected. This took place on August 1, 1916, the amendment failing along with eight others submitted at the time. Of this it has been said that the questions passed upon were rejected as a whole on account of facts other than the attitude of the public toward this particular subject.

The importance of such amendments to the constitution as preliminary to the enactment of compulsory laws, has been greatly discounted by reason of decisions of the Supreme Court of the United States upholding compensation laws of various types and forms as not in conflict with constitutional provisions; so that in the absence of specific limitations, which may be found by way of exception in some state constitutions, no bar appears to the enactment of a compensation law compulsory in form and of general application. Thus far, in but two states, California and Illinois, has an original elective law been supplanted by a compulsory one.

Types of Laws

The rapid growth of compensation legislation, involving as it has the almost simultaneous enactment of laws in a number of states, has operated to prevent the adoption of any one form of law as a type, so that although a single

fundamental principle underlies the entire group of laws of this class, its expression and application present great diversity of details in the different states. This extends not only to the primary factors of the scope of the laws and the amount of compensation payable under them, but also to the matter of making the laws compulsory or voluntary in their acceptance, the securing or not securing of the payments of the benefits, the mode of securing, where it is required, and methods of administration, of election or rejection, etc.

No fixed form of analysis or summary presentation can give in complete detail the provisions of the laws under consideration. They relate not only to the compensation of accidents, but to accident reporting, safety provisions, the enactment of safety laws, the establishment of insurance systems, premium rates, investments, the scaling of payments in cases of certain forms of negligence or their increase under certain conditions, procedure in arbitration, forms of appeal, and a great variety of subjects on which it would be impossible to generalize and which can be discovered only by a reading of the individual statutes. That there is a general similarity among the laws adopted by a few states can be clearly recognized, but it is obvious that at the present time it cannot be said that any one type of law is predominantly approved. It seems none the less certain, however, that the welfare of both employer and employees, as well as the public interest generally, would be served by the general adoption of uniform laws, just and certain in their operation and not dependent for their acceptance on the personal views or interests of individuals or groups of individuals.

It is encouraging to note in this connection that though there is some diversity and a manifest disposition on the part of some administrative and legislative bodies to regard variations as warranted, if not absolutely desirable, because of local conditions, there are certain tendencies to move in a common direction and thus approach a common end. In several states amendments have been made at every session of the legislature since the original enactment.

These changes liberalize the laws by reducing the waiting time, increasing the amount of benefits paid either by percentage increases or raising the maximum, or both, and by increasing medical aid. There are also some extensions of inclusion or coverage, while occupational diseases have been recognized as compensable until at the present time there are twelve states and the Federal Government caring for such injuries. The amount now paid as compensation in four states is 65 per cent of the em-

ployee's wages, and in twelve states 66½ per cent, exclusive of compensation under the Federal statutes; so that twenty-four states at the present time, as against twenty at the beginning of the year 1920, pay 60 per cent or more.

In 1920, sixteen states fixed the maximum weekly payments at \$12 or less. Now, no state has a maximum of less than \$12 for temporary total disability and only six have as low a standard as that, while thirteen now pay \$18 or more as against five at the earlier date. The waiting time is now less than one week in nine jurisdictions, one week in twenty-eight, and more than one week in ten, while at the earlier date only four laws fixed a waiting time of less than one week, twenty-two of one week and twenty of more than one week.

Another indication of a recognition of the previous, and in many cases continuing, inadequacy of relief is the passage of amendments allowing for permanent partial disability payments in addition to the payment for temporary total disability or the healing time. Such changes have been made comparatively recently in Colorado, Georgia, Hawaii, and New Mexico, while in New York, if the healing time is protracted beyond specified periods, the schedule for partial disability payments is correspondingly extended. The restriction on term and amount of payment by way of medical relief has been raised or eliminated in a few states in recognition of the importance of adequate treatment to restore the injured man to his employment. In two states new requirements as to insurance have been made.

In thirty-two states the employer and employee may exercise a choice as to accepting the provisions of the compensation law. Election by the employer is presumed in a majority of the states, but in ten positive action is required. These ten are Kentucky, Maine, Massachusetts, Michigan, Montana, Nevada, New Hampshire, Rhode Island, Texas and West Virginia. Where the employer rejects the law, action for damages may be brought without the

customary common-law defenses. Where he elects to accept the provision of the law, the acceptance by the employee is taken for granted, in the absence of rejection—except in Kentucky, where positive acceptance is required. In New Hampshire the employee may make his choice of remedy after the injury has been received. If the employer has accepted the law and the employee rejects it, actions for damages are subject to the common-law defenses, except in New Jersey and Pennsylvania, where the defenses are abrogated absolutely.

The laws are compulsory in fourteen states, neither employer nor employee having the option of choosing another remedy, except in Arizona, where a workman may elect prior to the injury not to come under the act. Suit is permitted in a number of states if the employer has failed to insure or permits premiums to remain unpaid.

No law is of complete coverage and the terms "elective" and "compulsory" apply to the laws in regard to the occupation said to be covered by the acts. Employers in occupations other than those classified as "covered" may generally accept the terms of the act, but forfeit no defenses by failure to do so. Such inclusion is designated as "voluntary" and may require the joint positive action of both employer and employee.

The accompanying map indicates the extent of compensation legislation in the United States and whether its acceptance is elective or compulsory; also, the states that have insurance funds managed by state officials and whether they exclude or compete with other insurance carriers.

Bulletin 423 of the Bureau of Labor Statistics of the U. S. Department of Labor also contains an analysis of the law of each state in comparable form as well as a comparison of workmen's compensation laws in Canada. This 687-page Bulletin may be procured for \$1.00 from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Our Front Cover Illustration

WE are indebted to the Asheville Supply & Foundry Co., Asheville, N. C., for the interesting photograph which appears on the front cover of this issue of CONTRACTORS' & ENGINEERS' MONTHLY, showing the erection of the steel work for the five-story and three-base-ment S. H. Kress Co. building in Asheville. It shows a Link-Belt crane, Model K-2, equipped with a 60-foot boom and 10-foot auxiliary jib giving a total lift of nearly 75 feet. This machine set 370 tons of steel in 25 working days and, although it was impossible to set the steel on the top floor, all of the steel was lifted and then taken up by

a small stiff-leg derrick for setting. A boiler weighing approximately 7 tons was also set in the building with ease by the use of this crane.

This interesting job of structural steel erection was handled by the Asheville Supply & Foundry Co. The general contractor was the Bowen Construction Co., El Paso, Texas.

Erickson Becomes Novo Distributor

THE Novo Engine Co., Lansing, Mich., has announced the appointment of the H. E. Erickson Co., 114 South Third Street, Minneapolis, Minn., as exclusive distributor for Novo engines, hoists, pumps and combination outfits in the north central territory.

Building and Using a Ramp in Subway Construction

By DANIEL J. HAUER
Construction Economist

THREE are two methods used in building subways in New York City. When the depth of the subgrade is 75 feet or more below the street surface, the tunnel method is used. These tunnels are driven from shafts sunk from the street or in public parks, when possible. The second method is known as the "cut and cover" method.

In years gone by the entire width of the street or part of the width was left open, and all of the work was done from the street surface. Street traffic had to be diverted to other thoroughfares. With streets being torn up for from two to five years, business along the routes of the subways suffered to such an extent that merchants were justified in opposing the building of subways near them, so that a change was made. Now the subways are excavated as a wide open trench, but a trestle work of timbers supporting metal I-beams and timber stringers with a heavy plank floor is maintained from the start, and all work of excavation and of building the subway is done under this cover. For this reason the process is called "the cut and cover" method. This method is in no way tunneling, as it has been termed and described in some publications. The tunnel method, as already mentioned, is an entirely different process.

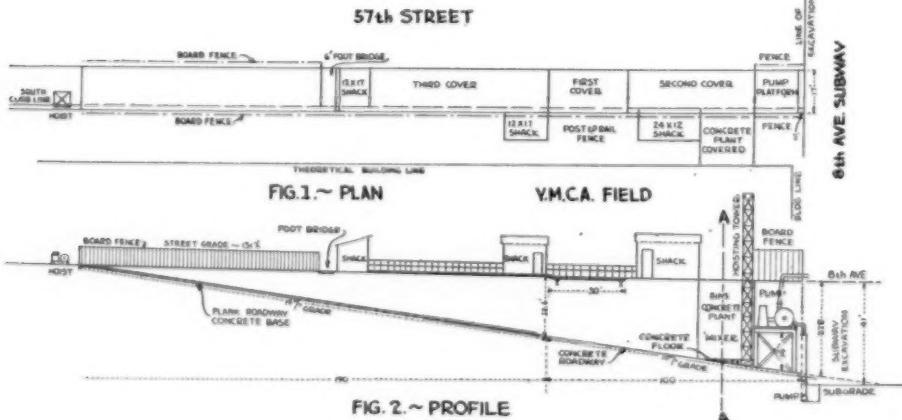
In previous years this trench excavation made under cover was to a great extent done by hand in the busy sections of New York. The excavated material was loaded into small cars and carried to elevator shafts, and brought to the surface, where it was dumped and the

muck hauled away. There are now several methods in which machines handle the excavation, in whole or in part, and elevate the material directly or by means of other machinery to the street surface. One such method is the use of steam or electric shovels for loading the trucks, which enter and leave the line of subways by a ramp.

It is in the use of these ramps that the subway contractors in New York City claim that they have not only cheapened the building of subways, but have made it possible to build much more quickly. This discussion is to be confined as far as possible to a description of the building of these ramps and their many uses, including only as much description of other subway work as may be necessary.

Early Ramps

Just prior to the advent of the United States into the World War, Rodgers & Hagerty, contractors, were building a double-deck subway on the Eastern Parkway, Brooklyn, in an open cut. Here the excavation was from 40 to 60 feet deep and steam shovels were placed in the subway trench. Owing to the locality, there were no underground pipes, ducts, etc., in the way of the excavation, so it was possible to build an incline or ramp, running longitudinally within the lines of the excavation, of timbers on trestle bents or partly supported by the cross-braces of the shoring in the wide and deep trench. Upon this incline or ramp, trains of cars were operated and the excavation with steam shovels and cars was carried to sub-



grade at a comparatively low cost. This is believed to be the first use of an incline or ramp in subway work, but it was not the first use of the steam shovel or cars for subway excavation, as these were used by Walter Gahagan in building the subway line to Coney Island prior to 1910, and shovels and cars were also used on the Fourth Avenue subway excavation in Brooklyn at about the same time. Inclines or ramps, however, were not used upon these contracts as the excavation was handled similar to a railroad cut and the trains operated upon tracks laid at grade in the trench or cut excavation.

Patrick McGovern was probably the first contractor to use a ramp at right angles to the subway excavation, and without the neat line of the excavation of the structure. In the business section of the city, ramps can be used only at right angles to the excavation and on side streets, as the one described in this article. This is due to the fact that there exists in the bed of the street a great number of substructures which must be maintained during the period of construction, which is frequently from three to four years. A careful examination of a map of substructures by the writer showed the following in one city block: two street car tracks with twenty-four terra-cotta ducts serving these tracks; another bank of sixty-four ducts; three lines of wrought iron duct; one line of fiber duct; seven small service ducts; six duct manholes; three service boxes and three electric lights. In addition to these, there were two pipe sewers, one 18 inches in diameter and one 15 inches in diameter, each with a manhole, and a circular brick sewer 30 inches in diameter with two manholes, three catch basins and four inlets. The water-pipes are a 20-inch high-pressure main with one blow off, a 16-inch low-pressure main, and a 10-inch low-pressure pipe with two high-pressure fire hydrants and one low-pressure plug with the 8-inch pipe serving them. There are two 8-inch mail tubes with a 2-inch air-pressure pipe and 6 gas pipes, two 10-inch, one 8-inch, one 6-inch, and two 4-inch. A 12-inch steam pipe also goes along one side of the street with the accompanying manholes, and there are in all cases service lines to the buildings on each side of the street. Under the sidewalks are numerous vaults and ducts leading to the cellars. In some cases there are sumps and pumps for drainage or elevating sewage, boilers, ice plants, ventilating fans and blowers, and besides other obstructions in this city block there are eight columns and footings of an elevated railroad to be maintained and underpinned.

Thus it will be seen that there is a network

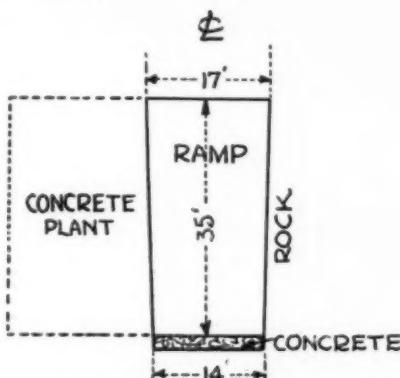


FIG. 3—SECTION A-A, SHOWING A CROSS-SECTION OF RAMP

of structures—or they could be termed obstructions—encountered for the first ten feet or more of the excavation, and as has already been explained, the trench must be kept covered so that traffic can be maintained on the thoroughfare. There is not much chance for building a ramp through such a conglomeration of structures. So, for the same reason that shafts were built off the line of the old subway structure, so are the ramps built at right angles. This means that they must be built in the side street. The ramp allows steam, gasoline, electric, or air shovels to be taken into the excavation and trucks to be loaded directly, making their entrance and exit by the ramp. This is one method which does away with hand-work, and ramps are being used more and more by contractors.

Diversity of Opinion Regarding Value of Ramps

There is a diversity of opinion as to the advisability and cheapness of the ramp, and not all contractors in New York are using this method, although it is becoming quite generally used. In Philadelphia there is an extensive program of subway building going on at present and the shaft method is in general use. One strong advocate of this older method is the Keystone Construction Company. On the other hand, Patrick McGovern has a large contract at the north end of Broad Street in a sparsely built-up section, and his excavation is being carried in rock to a depth of about 50 feet. He is using steam shovels and the ramp on this section, but the ramp is within the lines of the structure and runs longitudinally with the trench. As already mentioned, Mr. McGovern is a man of vast experience in heavy construction work and was one of the early users of the ramp.

Cost of Ramp Excavation

It is generally supposed that the cost of excavating a ramp at right angles to the subway is borne by the contractor, but this is an erroneous impression. Under the old method of using shafts and elevators, when it was not possible, owing to traffic conditions and the obstructions under the street surface, to locate a shaft within the lines of excavation of the subway, a provision was made that all excavation outside the structure should be paid for when the site of the shaft was approved by the engineer. The contractor was also paid for restoring the pavement occupied by the shaft, but the cost of backfilling the shaft was included in the price of excavation.

A similar provision of the new contract and specifications covers the building of the ramp. It provides that payment will be made for all excavation for ramps within two parallel planes not greater than a distance of 17 feet apart and when the ramps have a grade from the trench to the surface not flatter than 14 per cent. Payment is also made for the restoration of the pavement between the neat lines of the excavation, as provided by the specifications, while the backfilling of the ramp is included in the price of the excavation.

Most subway contracts or sections as let cover about ten city blocks and the contract provides that but two ramps shall be built in a section unless ordered otherwise or permission be given by the engineer. Contractors were compelled to make a long and strenuous fight to secure these provisions in the specifications, yet now all concerned feel that a decided step forward has been taken.

The price paid for excavation upon the subways in New York City covers many items. There may be several prices, as one for dirt, another for rock, one for spoil above ground-water and another below it, one for excavation within the trench and another without, as for new sewer lines, etc., but in all cases the price covers the shoring of the sides, the trestle work supporting the cover, and the cover itself, the maintaining of all pipes, except gas pipes, and their restoration, the maintaining and restoring of duct lines, with the exception of terra-cotta ducts, which cannot be maintained or restored, and which necessitate the laying of new duct banks. Included also are all work of excavating, pumping, backfilling, and maintaining traffic and service of light, water, steam, mails, etc., during the period of construction. No extra costs are put upon the city except those specified in the contract, such as for maintaining gas pipes, street-car tracks, underpinning structures, building sewers, and restoring pavements.

This explains why ramps are paid for when outside the lines of excavation.

The ramps to be described are on Route 102, Section 5, of the Eighth Avenue subway now being constructed. This is a rapid transit railroad to run to Washington Heights, with provision made for running a line at some later period to the Grand Concourse, with a branch through 53rd Street to Queens Borough. This section of the subway runs from 48th Street to 58th Street, with three ramps specified, all at right angles to the subway and running west from the structure. The first of these ramps is located on the south side of 51st Street, the second is on the north side of 54th Street, while the third and last one is on the south side of 57th Street.

Three ramps are allowed on this section because from 50th Street to 53rd Street there are four tracks on an upper level and two tracks each in a separate trench running east at 53rd Street to go to Queens Borough. These two trenches start at a common grade at 50th Street and get to a lower level, about 20 feet deeper than the upper level, where they leave Eighth Avenue. Two tracks come from the east at 53rd Street from Queens Borough and turn north on Eighth Avenue in a separate trench. The subgrade of the lower level at 54th Street is about 60 feet below the street level. As these tracks reach 57th Street, they come to the same level as the upper tracks so that at this street there is a four-track subway, and the lowest point in the grade of the upper level of this section is just south of 57th Street. The excavation for this section amounts to 292,500 cubic yards, of which about 75 per cent is solid rock, a mica schist, which in many cases comes close to the surface. Within two squares of this ramp more than one-third of the excavation is located. This is one of the reasons why the ramp at 57th Street is the most important one in this section.

Figure 1 shows a plan of the ramp, while Figure 2 is a profile running at the left from the street level to the bottom of the subway trench. The ramp is 290 feet long. From the street down toward the trench for 190 feet the grade is 14 per cent, while the last 100 feet has a grade of 15 per cent. In the length of the ramp the grade drops 41.6 feet, but inasmuch as the street grade is minus 1.31, 3.8 feet of this height is overcome in the excavation, so that the depth below the street level is 37.8 feet. The subgrade of the subway is 41 feet below the street level, so that a small incline or ramp runs from the side of the subway excavation to the center line, lengthening the ramp and cutting down the amount of excavation. Thus it is

seen that the ramp is well designed and more than conforms to the specifications.

The excavation for the ramp was about 3,550 cubic yards, mostly of rock. As there is less than two feet of overburden over the rock strata, the rock naturally had to be blasted. The drilling was done by Ingersoll-Rand Jack-hammers, with air furnished from a central compressor plant. Holes from a few feet up to 10 feet in depth were drilled, most of the excavation being done from on top, very much in the manner of sinking a shaft, until some depth was obtained and the rock was blasted out so as to work it more in the form of an open cut. This can not be done, however, until the grade is established, and according to the specifications the proper gradient is essential for the contractor to receive pay for the work.

The holes were shot with Du Pont 40 per cent $\frac{1}{2}$ -pound sticks of dynamite, using wire and rope mats to hold down the blasted rock. Men loaded the rock by hand into one-yard Union dump-buckets. These buckets were lifted by a crawler-mounted Bucyrus-20 crane operated by electricity. This crane ran along on the street surface, raising the steel dump-buckets from the trench of the ramp and dumped them into five-ton Mack trucks. The rock was hauled to the city pier on the Hudson River at 58th Street and dumped into scows to be hauled away. The excavation of the ramp was pushed in the early months of the contract, so as to get the electric shovels and all the other equipment into the subway trench to rush that excavation. Thus, the ramps not only served to allow trucks to enter and leave the trench, but made possible the use of much machinery in the subway excavation and afforded an easy way of taking the machinery in and out of the trench.

In addition, these ramps are used for many other purposes. At first, a cover was placed over a part of the ramp, as shown, and then two I-beams were used and heavy parts of machines and pipes were stored there. The specifications provide that a post and railing fence be built along the sides of the ramp. It will be noted that either a solid board fence or a post and rail enclosure was built where the ramp was covered to be used for storage. One shack was also built over the ramp and two alongside for tools. One houses a 24 x 10 auxiliary air-compressor.

At first, three pumps were used to take water from the excavation. Then as the work advanced, a trestle platform was built, as shown in the ramp, so that trucks could pass under it, and a 16-inch Lawrence centrifugal pump was placed on this platform with a suction pipe run

to a sump in the trench. This electrically-operated pump delivered the water to a sewer.

A concrete roadway was built in the ramp and for about 200 feet heavy planks were imbedded in the concrete as the trucks slipped less on the planks than on concrete. A supply of cinders or ashes is also kept at hand to use under the truck wheels in rainy or icy weather. For winter weather a hoisting engine was placed near the curb line or street level to assist the loaded truck in mounting the grade. This hoist is a single-drum Clyde unit with a General Electric crane motor and control.

After blasting in the subway, the rock is loaded into Mack 5-ton trucks carrying about $3\frac{1}{2}$ cubic yards of rock to a load by means of a Marion No. 21 electric shovel with crawler traction.

Storage Facilities at Ramp

As the excavation in the subway approached subgrade, the contractor excavated a chamber in the side of the ramp at his own expense to set up his central concrete mixing plant. This is shown in Figures 1 and 2. Trucks will bring concrete materials to the job, cross the cover on the ramp and dump into bins over the mixers. Concrete can be taken from the mixer and carried into the subway trench by means of the ramp and concrete can also be elevated to the street surface by means of the hoisting tower, loaded into trucks, and carried to any part of the job and chuted into place through the cover of the subway trench. This is a decided asset in using a ramp.

The contractor's plant is centralized at the ramp, so that the ramp is important not only for excavation and for concrete mixing, but for storage and for carrying machines and heavy materials into and out of the subway trench.

Electric wires for lighting purposes and for operating machines can likewise be carried for at the ramp and thus be carried into the trench. It is the logical way for men to enter instead of climbing up and down ladders. There is no doubt that other uses will be found for these ramps as work progresses.

The job described is a contract for more than \$6,500,000 of construction, and yet, because of the use of ramps, on January 1, with 30 per cent of the contract time expired, the construction is nearly 50 per cent totally completed and the subway is more than 50 per cent ready for actual operation.

The contractors who are well posted as to modern methods of subway construction believe that ramps have so advanced the use of machinery and the progress of the work that

it is now possible to build subways quicker and faster than the city of New York can make the plans and obtain the money for construction.

The contractor for this section of the subway is the Heyman & Goodman Company, Inc. The Board of Transportation, acting for the city of New York, is in charge of all subway con-

struction, with Robert Ridgway, Chief Engineer, Jesse O. Shipman, Division Engineer, H. J. Alexander, Assistant Engineer in Charge, and M. S. Miller, Section Engineer directly in charge of this contract. Ralph W. Greenlaw is Chief Engineer for Heyman & Goodman Company, Inc.



METAL DREDGE OF THE ALLEGHENY RIVER SAND COMPANY WITH A CAPACITY OF THREE TONS OF SAND AND GRAVEL PER MINUTE

A Metal Dredge Boat of Large Capacity

Constructed for Allegheny River Sand Corporation, Mahoning, Pa.

THE Allegheny River Sand Corporation has a metal dredge boat, with a capacity of 3 tons a minute or almost 200 tons an hour, which dredges sand and gravel from the Allegheny River at Mahoning, Pa., just north of Kittanning, Pa. The long ladder-dredge reaches down into the river to a maximum depth of 37 feet.

Because the river sand is free from loam and therefore needs no washing, it makes a first-quality fine aggregate. The buckets raise the sand and gravel to a rotary screen which grades it, delivering the screened material in various sizes to barges moored alongside. The dredge is operated by a 175-horsepower engine.

The cabins which enclose the engine, boiler and controls, are built, not of wood, but of galvanized sheet metal. It is said that metal dredges now bid fair to replace the old-fash-

ioned wooden dredge boats because they are more durable and fire proof. The known resistance of commercially pure iron to the corrosive effect of coal smoke and water caused the builders to specify this material for the cabins. The dimensions of the various cabins are: two engine cabins, each 49 feet long, 10 feet wide by 8 feet high at the eaves; a boiler cabin, 37 feet long, 27 feet wide and 11 feet high at the eaves; and a control cabin, 8 feet long by 8 feet wide and 7 feet high at the eaves. About 10,000 pounds of iron was used for roofing, siding, etc.

The hull measures 120 feet by 28 feet by 5 feet, molded. The dredge weighs 315 tons gross when operating, allowing 32 tons for water and materials. The net weight is about 283 tons. This dredge was built with Armco ingot iron roofing and siding by the Midland Barge Company.

Rock Excavation for a Water-Works Tunnel

By RICHARD R. BRADBURY
Resident Engineer, Water-Supply Board, Providence, R. I.

WATER from the new Scituate Reservoir of the Providence, R. I., water-supply is carried to the city through the Scituate Aqueduct, the westerly portion of which consists of a tunnel about three and one-third miles long. This tunnel is in hard rock for its entire length and is of horseshoe section, 7 feet high and $7\frac{1}{2}$ feet wide, except for short portions adjacent to the portals, which are circular, $7\frac{1}{2}$ feet in diameter. The entire tunnel is lined with concrete.

Design

As first laid out, the tunnel was straight between portals. Core borings on the center line showed a depression in the rock surface deeper than the grade line of the tunnel at one point. In order to avoid soft ground at this point, the tunnel alignment was moved about half a mile north of the straight line, the location of the portals remaining the same. This put an angle of 13° and 37 minutes in the line at a point about one-third of the way from the west or up-stream portal. A construction shaft located near a road crossing the tunnel line was about midway between this angle and the east portal.

The circular sections at the ends of the tunnel were designed to seal it to the rock. In operation, the tunnel is under a head of about 20 feet and these sections were carried in until

firm rock with a minimum depth of 40 feet over the tunnel roof was reached. The invert is carried to solid rock, the concrete lining reinforced, and the whole section grouted under light pressure to insure water-tightness. These circular sections are 258 feet and 572 feet long at the west and east portals, respectively.

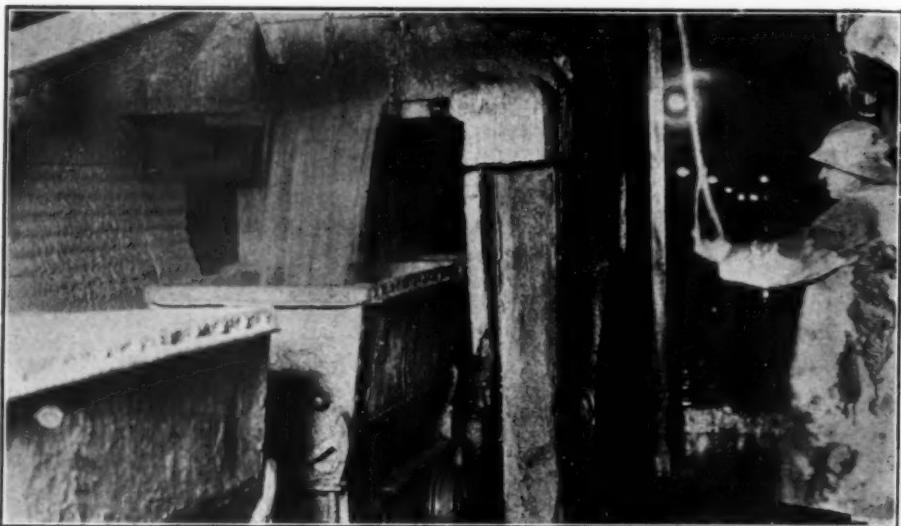
The grades in the tunnel are very slight. The difference in elevation between the two portals, a distance of 17,642 feet, is 1.52 feet. In order to facilitate construction, the grade is all in the portion 5,000 feet west from the shaft, which made it possible to drive from both portals and in both directions from the shaft without working down-hill.

The shaft was located directly on the tunnel center line and was 14 feet square in the clear. The total depth to the tunnel invert was 140 feet, of which the first 21 feet was in earth. This was a shaft for construction only and was closed with concrete and backfilled after the tunnel was completed. The tunnel was excavated to an ordered line within which no rock was permitted to project. The shape of this line was given on the contract drawings, but its distance from the face of the masonry lining was determined in the field as the work progressed, and depended upon the character and soundness of the rock. This distance was the minimum thickness of the lining. Payment for



VIEW FROM THE EAST END OF THE SPOIL BANK AT THE SHAFT OF THE SCITUATE TUNNEL, LOOKING SOUTHWEST.

The spoil bank is in the foreground and the head-frame and the crushing and screening plant are seen in the center, the blacksmith shop at the right, and the compressor at the left.



CONCRETE CHUTE AND CARS OF CONCRETE TRAIN, AT FOOT OF SHAFT OF THE SCITUATE TUNNEL

excavation was to a line 12 inches outside of the ordered line regardless of the actual excavation. It was to the contractor's advantage, therefore, to excavate as near to the ordered line as possible without running his trimming up too high. As a matter of fact, the trimming in this tunnel was quite small, although the actual excavation under-ran the pay excavation considerably. This was due partly to the nature of the rock, which broke well between holes, but more to the watchfulness and skill of the contractor's superintendent.

The first table gives a comparison of the actual and theoretical excavation for a part of the tunnel including the circular section at the west portal.

Throughout the horseshoe section, and the west circular section, the rock encountered was a hard gneissoid granite, except for two short stretches near the west circular section, where the rock was partially disintegrated. In one of these stretches timber bents were necessary to support the rock, although lagging was not used. Narrow dikes of trap were encountered occasionally. One of these, near the shaft, was 22 feet wide. The others were only a few feet in width. A few seams from 1 to 6 feet wide and filled with fine white sand were also encountered. Two of these required timbering.

The east portal was in schist. This rock became quite soft as the work on the east circular section progressed and was timbered for a distance of 220 feet, beginning 287 feet in from the portal. The schist then became more firm. The change from schist to granite was

near this point, though no sharp contacts were noted. The second table gives the types of tunnel used, with the minimum thickness of concrete lining.

Over 99 per cent of the horseshoe section was untimbered and in 93 per cent the smallest cross-section was used. This reduced the quantities of excavation and concrete and lowered the cost quite materially.

The concrete lining of the horseshoe section is un-reinforced. The sidewalls and arch are separate from the invert, the sidewalls extending about 12 inches below it. The invert is 5 inches thick, laid on hard-packed tunnel debris. Weepers of 2-inch pipe extending through it were placed at intervals of 20 feet along the center line to relieve upward pressure from the ground water at times when the tunnel is unwatered. Streams encountered in excavation were led through the lining into the tunnel. These streams were few and small.

The lining of the circular sections extends to the solid rock all around. No dry-packing was used in the west circular section, but in the east section the roof was dry-packed. Grout and vent pipes were inserted in the roof. The grout pipes extended to the top of the concrete only, but the vent pipes were placed with their tops as high as possible. A vent pipe was placed in every pocket in the roof. Streams were brought through the lining in weepers in the same manner as in the horseshoe section. All grout and vent pipes and nearly all weepers were 2-inch steel pipe. A few weepers were 1½- and 1-inch.

TABLE I
WEST PORTAL

Station	Lin. ft. excavated	EXCAVATION—cu. yds.		
		Actual	Theoretical	Margin
4+40	...	0	0	0
5+40	100	271	324	53
6+30	190	542	616	74
7+50	310	869	1,004	135
8+90	450	1,251	1,458	207
10+70	630	1,758	1,992	234
11+40	700	1,906	2,210	304
12+05	765	2,152	2,481	329
14+10	970	2,718	3,095	377
16+10	1,170	3,261	3,689	428
17+80	340	3,803	4,194	391
19+20	1,480	4,269	4,622	353
22+20	1,780	5,139	5,530	391

WEST OF SHAFT

Station	Lin. ft. excavated	EXCAVATION—cu. yds.		
		Actual	Theoretical	Margin
108+30	...	0	0	0
108+50	180	518	535	17
108+00	230	666	683	17
104+80	350	1,011	1,040	29
103+60	470	1,364	1,396	32
101+90	640	1,916	1,901	-15
100+50	780	2,321	2,317	-4
97+60	1,070	3,159	3,178	19
98+90	1,140	3,368	3,386	18
98+00	1,230	3,639	3,653	14
95+50	1,280	3,784	3,802	18
94+30	1,400	4,137	4,158	21
93+10	1,520	4,479	4,514	35
92+40	1,590	4,677	4,722	45
90+50	1,810	5,304	5,376	72
88+60	1,970	5,801	5,851	50
86+60	2,170	6,388	6,445	65
84+30	2,900	7,057	7,128	71
83+40	2,490	7,303	7,395	92
81+60	2,670	7,818	7,930	112
80+70	2,760	8,092	8,197	105
79+30	2,900	8,470	8,613	143
77+60	3,070	8,943	9,118	115
76+10	3,220	9,365	9,563	198
75+20	3,310	9,613	9,831	218
72+00	3,630	10,476	10,781	305
68+00	4,030	11,574	11,969	395
62+10	4,620	13,188	13,721	533
57+20	5,110	14,566	15,177	611

EAST OF SHAFT

Station	Lin. ft. excavated	EXCAVATION—cu. yds.		
		Actual	Theoretical	Margin
108+60	...	0	0	0
110+10	150	485	445	-40
111+30	270	836	802	-34
112+10	350	1,077	1,040	-37
113+60	500	1,530	1,485	-45
114+50	590	1,805	1,752	-53
116+00	740	2,242	2,197	-45
120+50	1,190	3,521	3,534	13
123+80	1,520	4,480	4,514	34
125+60	1,700	4,961	5,049	88
127+50	1,890	5,506	5,613	107
129+60	2,100	6,129	6,237	108
130+90	2,230	6,487	6,623	136
132+20	2,360	6,869	7,009	140
133+50	2,490	7,233	7,395	162
134+40	2,580	7,487	7,663	176
136+00	2,740	7,934	8,138	204
137+40	2,880	8,312	8,554	242
139+10	3,050	8,776	9,058	282
140+80	3,220	9,240	9,563	323
141+90	3,330	9,524	9,890	366
146+70	3,810	10,819	11,316	497
148+70	4,010	11,357	11,910	553
151+30	4,270	12,062	12,682	620
152+30	4,370	12,336	12,979	643
158+30	4,970	14,120	14,761	641

Concrete of the circular section was reinforced with hoops of 1-inch square steel bars. These were at first spaced on 12-inch centers, but it was found extremely difficult to place the concrete of the key through such close spacing. It was therefore changed to 9 inches, 9 inches and 18 inches, which gave a hole every 3 feet through which the concrete could be passed.

Construction

The tunnel was built under contract by the Keystone State Construction Company of Philadelphia, Pa. Work was started at the site of the shaft on September 20, 1922. The contract was finished on September 29, 1925.



SCITUATE TUNNEL LOOKING WEST, SHOWING CONCRETE LINING THROUGH SAND SEAM
Water dropping in foreground shows small amount of leakage after grouting

TABLE II

Station	Length, feet	Minimum thickness, in.	Type	
4+38				West Portal
4+38-6+09	258	6	Circular	
6+06-7+02	6	Transition		
7+02-0+01	199	6	Horseshoe	
9+01-11+46	245	3	Horseshoe	
11+46-12+09	63	12	Horseshoe	Timbered
12+09-17+51	542	3	Horseshoe	
17+51-18+22	99	12	Horseshoe	
18+50-44+22	2,372	3	Horseshoe	
44+22-44+77	55	12	Horseshoe	
44+77-48+78	396	3	Horseshoe	
49+78-49+80	681	9	Horseshoe	
55+54-173+94	11,840	3	Horseshoe	
173+04-175+02	108	12	Horseshoe	
175+02-175+08	6	Transition		
175+08-175+73	65	12	Circular	
175+73-177+60	220	12	Circular	Timbered
177+93-180+80	297	6	Circular	East Portal
<hr/>				17,642

It was at first intended to do all of the work, except that in open cut, from the shaft in order to obtain economies in plant, camp construction, and overhead charges. The shaft excavation was completed on December 9, 1922, and the tunnel headings turned the same day. The shaft was sunk by hand-work, and the earth portion close-sheeted with 3-inch sheeting braced by sets of 12- x 12-inch timbers on 5-foot centers. The rock was drilled with jackhammers in lifts of about 8 feet, 40 holes to the round, and mucked by hand in a tipping bucket that was handled by a stiff-leg derrick.

The permanent plant consisted of three No. 10 Ingersoll-Rand air-compressors, a Sturtevant blower for tunnel ventilation, a drill sharpener with oil forge, a No. 8 gyratory crusher, bucket elevator and rotary screen, two cages with hoists, two Hoar tunnel shovels, four storage battery locomotives, muck and concrete cars, drills, etc.

This plant was run by electric power brought over a specially constructed pole line about a mile and a quarter long from the main line of the Narragansett Electric Lighting Company. The line current was 3-phase and 60-cycle, with 23,000 volts. This was stepped down to 550 volts for the air-compressors and shaft hoist and to 220 volts for general use around the camp and in the tunnel.

For the tunnel excavation, four Water Leyner drills set up on two vertical posts were used in each heading. A round consisted of 23 holes. It was at first hoped to make advances of 12 or more feet, but this was found impracticable owing to the hardness of the rock and the narrowness of the tunnel. Advances averaged 7.7 feet. Grasselli dynamite was used—both 60 per cent and 40 per cent. The holes were loaded rather heavily in order to break the

muck up well, so as to give ease in handling and to make as large a proportion of the muck as possible of suitable size for the crusher. Something over 9 pounds of dynamite was used per cubic yard.

Hoar tunnel shovels, air-driven, were used for mucking. They proved very successful, although requiring constant attention and numerous repairs. The muck was loaded in standard end-dump mine cars hauled to the shaft by storage battery locomotives. A single 30-inch-gage track was used, with switches about one-half mile apart.

Progress at the two headings driven from the shaft was slower than had been anticipated. The contractor was falling behind schedule, and so on June 6, 1923, work was started at the west portal. The plant was similar to that at the shaft except that but one compressor was used instead of three. Electric power from the Narragansett Electric Lighting Company was used. On January 7, 1924, excavation was started at the east portal. This work was done by the use of two small portable gasoline-engine-driven compressors operating two drills, and was carried only a few hundred feet. The timbering in the east circular portion was composed of three-piece bents of 8- x 8-inch timber set on steel pins in the sidewalls and spaced 4 feet on centers, lagged with 3-inch lumber and dry-packed. Grout and vent pipes were set at the same time that the dry-packing was placed.

Concrete for the lining of the horseshoe section was mixed in a central mixing plant erected at the head of the shaft. This plant consisted of a 1-cubic-yard Ransome concrete mixer arranged to discharge directly into an 8-inch wrought iron pipe leading to a steel hopper at the foot of the shaft. Above this mixer were two large bins, one for crushed stone and one for screenings, with chutes leading directly to the measuring hopper. Above the bins was a rotary screen which separated the product of the crusher into screenings, crushed stone and tailings. All stone over 2½ inches was rejected and returned to the crusher. A No. 8 gyratory crusher was used, mounted at the foot of the chute from the tipple into which the muck cars dumped. This crusher discharged into the boot of a bucket elevator which conveyed the crushed aggregate to a rotary screen in the top of the mixer house. Cement was hauled about 3½ miles by motor truck from Oaklawn, the nearest railroad station, and was stored in a cement house adjacent to the mixer house. From this cement house, it was transported to the charging room

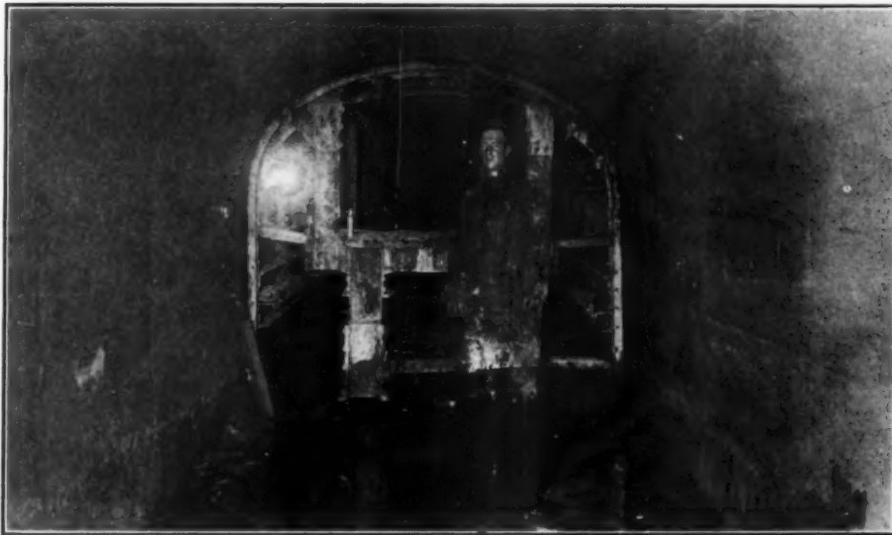
of the mixer by belt-conveyor.

On October 31, 1924, the headings east from the shaft and from the east portal met, and six days later the first concrete for the lining was poured. This lining was cast in three sections; first, footings for the two sidewalls to about a foot above the invert; next, the remainder of the sidewalls and the arch all in one piece; and last, the invert.

The forms for the sidewall footings were built up of wood and faced with sheet steel. They were 16 feet long and about 2 feet wide, light, and easily handled. They were set carefully to line and approximately to grade and braced top and bottom to the track at the side of the tunnel. Concrete was brought from the

braced tight against the faces of the concrete wall footings.

The concrete was placed in this form by means of a concrete gun. This machine consists of a cylinder of about 12 inches inside diameter, in which moves a tightly fitting piston. The rear end of the cylinder is open at the top in the form of a hopper. The piston is drawn back to just clear this hopper, through which a charge of concrete is introduced, and the piston is then moved forward until the hopper opening is closed. Compressed air is then introduced into the cylinder in such way that the charge of concrete is forced from the gun through a line of 6-inch wrought iron pipe leading to the roof of the tunnel and along it to the far end



SCITUATE TUNNEL LOOKING WEST, SHOWING FINISHED ARCH AND SIDEWALKS AT REAR END OF STEEL FORMS

The invert had not been placed when this photograph was taken.

shaft in Koppel side-dump concrete cars and dumped directly from the cars into the forms.

A steel form, 150 feet long, made by the Blaw-Knox Company, was used for casting the sidewalls and arch. In front of this form was a steel carriage for a concrete gun and two hoppers, and in front of this again an inclined runway 50 feet long. The whole outfit measured about 250 feet. It was mounted on wheels running on the regular tunnel track and was pulled ahead by an electric hoist operating a tackle which was made fast to the track ahead of the incline. The form was set to grade by two rows of jacks and to line by turnbuckles and wooden braces. The skirt of the form was

of the form. The form is filled, beginning at the far end and working back toward the gun. The 6-inch pipe is made in 5-foot lengths fastened together by special couplings, and is shortened one or two lengths at a time as the work progresses.

The concrete invert was cast last. For this work steel screeds, bent to shape, were set at grade from wall to wall. The track was raised in sections about 100 feet long, blocked up about two feet above grade, and the excavation of the bottom was made. Concrete was brought in cars and dumped along the walls. The track was then removed, and the concrete was pulled down to the center and screeded

TABLE III

Description	Unit	Quantity	Unit price	Total cost	Cost per ft. of tunnel
Sinking shaft in earth.....	lin. ft.	21.06	\$250.00	\$5,265.00	\$0.30
Sinking shaft in rock.....	lin. ft.	118.80	300.00	\$35,640.00	2.02
Excavation in tunnel.....	cu. yd.	53,129.93	1.00	637,581.10	36.15
Enlargement of tunnel.....	cu. yd.	524.10	1.00	8,390.10	.48
Permanent timbering in tunnel.....	cu. yd.	17.976	110.00	1,977.36	.11
Temporary timbering in tunnel.....	M. cu. yd.	5.613	130.00	729.69	.04
Shaft and tunnel drainage.....	lin. ft.	17,771.72	1.00	17,771.72	1.01
Forms for masonry lining.....	lin. ft.	17,638.78	2.00	35,277.56	2.00
Concrete, horseshoe section.....	cu. yd.	20,342.15	7.00	142,395.05	8.07
Concrete, un-reinforced circular section.....	cu. yd.	19.98	10.00	199.80	.01
Reinforced concrete.....	cu. yd.	1,433.75	11.00	15,771.25	.89
Dry-packing.....	cu. yd.	265.42	2.00	530.84	.03
Drilling holes in rock or masonry.....	lin. ft.	404.60	2.00	809.20	.05
Steel pipe for grouting, etc.....	lin. ft.	1,186.00	.40	474.40	.03
Making connections for grouting.....	each	120.33	1.50	180.49	.01
Grout.....	cu. yd.	397.28	15.00	5,959.20	.34
Portland cement.....	bbl.	30,005.50	3.00	90,016.50	5.10
Steel for reinforcing concrete.....	lb.	95.411	0.05	4,770.55	.27
Liquid chlorine.....	lb.	1,965.00	0.20	393.00	.02
Chlorine dosing machines.....	each	2.00	2,500.00	5,000.00	.25
Locker houses.....	each	2.00	4,500.00	9,000.00	.51
Cleaning up.....			1,000.00	1,000.00	.06
Extra work.....				486.12	.03
Total cost.....				\$1,019,600.29	\$57.81
Shaft excavation.....				40,905.00	2.32
Total cost exclusive of shaft excavation.....				\$978,695.29	\$55.49

with a 6-inch pipe.

The lining of the circular sections at the two portals was placed by hand, the method being practically the same in each case. The invert was cast first and screeded in 16-foot lengths. Wooden ribs were then erected and the lagging, which was of 3 x 3-inch by 16-foot hard pine, was placed a few pieces at a time as the concrete was shoveled into the forms. The last five feet across the top of the arch was mixed very dry, placed in 4-foot lengths, and rammed back hard against the roof of the tunnel. Grout pipes were placed in this roof about every 15 feet.

At the east portal the concrete was mixed in a $\frac{1}{2}$ -yard steam-driven portable concrete mixer and transported to the forms in a small car drawn on a track by a horse. At the west portal a $\frac{1}{2}$ -yard gasoline-driven mixer was used for mixing and concrete buggies were employed for transportation.

The circular sections were grouted, using a Caniff grout machine with air pressures up to about 25 pounds. Grouting was started at the portals and carried straight ahead to the end of the circular sections, taking each pipe as it came. The weep holes as a rule did not take a large amount of grout, the maximum in any one hole being 2.4 cubic yards, nor did the grout travel far to appear in some other hole. When grouting in the roof, a considerable length of tunnel could be grouted from a single-hole. The maximum amount of grout poured into a single hole in the roof was 52 cubic yards and the maximum distance to which grout was forced was about 100 feet.

Grout was composed of neat portland cement and water and was mixed in varying proportions of 1:4 to 1:1. Unless it was known that

a hole was quite open, the start was made with the thinnest grout, working up gradually to the thicker as the hole showed ability to take it.

Cost

The third table gives the actual cost of the tunnel to the city as paid to the contractor. This is based on the various tunnel items of the contract, the quantities being taken from the final estimate.

In considering these costs it should be borne in mind that there were two factors that undoubtedly reduced them considerably. One of these factors was the unexpected soundness of the rock through which the greater part of the tunnel was driven. When 93 per cent of the main section can be made of the minimum size, large economies are obtained in excavation, concrete and cement, which could not be expected under usual conditions. The second factor was the low unit prices bid by the contractor. Although his work was carried on with a high degree of efficiency, it was not possible to carry the contract through and make a fair profit with these figures and it should not be assumed that they are likely to be repeated.

The only variable items in the contract besides excavation, concrete and cement were the timbering, dry-packing, and grouting. These were all extremely small in quantity, and this also decreased the actual cost of the tunnel.

Personnel

The Scituate Tunnel was Contract 21 of the Water-Supply Board of the City of Providence. Both design and construction were under the supervision of the Chief Engineer, Frank E. Winsor, now Chief Engineer, Special

Construction Commission, Boston Metropolitan Water-Supply District; William W. Peabody, Deputy Chief Engineer, now Chief Engineer, Water-Supply Board; and Francis B. Marsh, Designing Engineer. The writer was in charge of the field work and construction as Resident Engineer, assisted by Wilfred D.

Chapman and Philip S. Brown, Assistant Engineers. The contractor, the Keystone State Construction Company, was represented by Paul G. Brown, General Manager, with Philip Pagliaro as Resident Superintendent.

ACKNOWLEDGMENT.—From a paper read before the New England Water Works Association, Providence, R. I., September, 1926.

Ingenuity Is Good Advertising

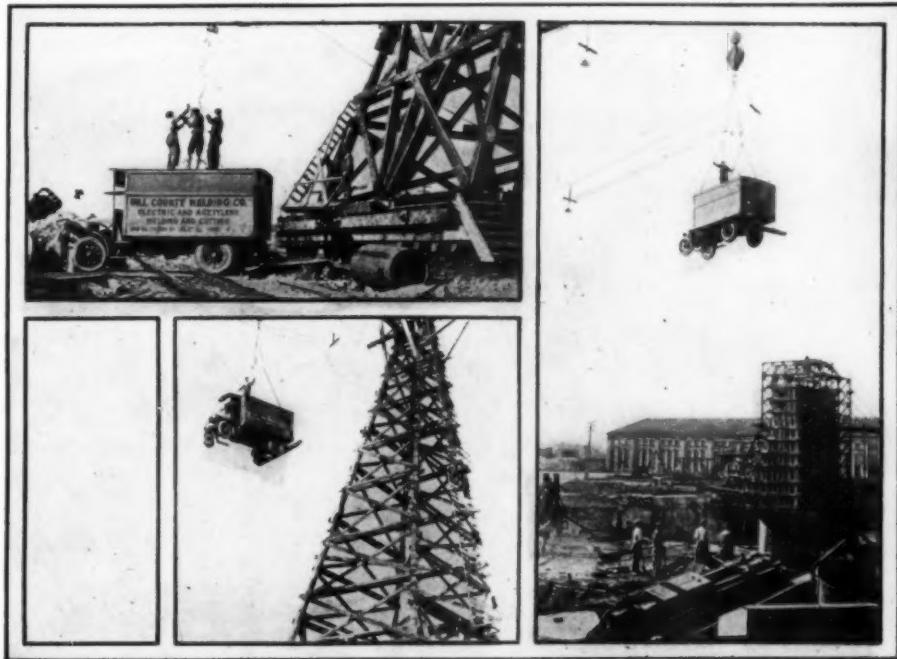
Welder Establishes Prestige by Using Air Route to Reach Job in Quickest Possible Time

PROVERBIALY, there are many ways of skinning a cat. Sometimes only one way occurs to a man confronted with a job. Perhaps that way is unsatisfactory and he is not willing to follow it out, but because he is unable to think of another method, he gives up the job completely, and thereby runs the risk of losing not only one customer but many others who may hear of his lack of inventive genius.

To the man with ingenuity, there is no such danger. Any number of ways of doing a difficult job will present themselves to him, and he needs only to use good judgment to decide

between them. This is the man who is going to get all the work he can handle, for his clients will come to realize that he permits no obstacles to stand in his way after he has undertaken a piece of work.

Recently, a contract welder was given a rush order to do some miscellaneous welding and cutting work on some locks which were being constructed on the opposite side of the Mississippi River, but it happened that there was no easy way of crossing the river to the work. Just because this man found it such a difficult matter to get there, did he give up the job altogether? He did not. He knew



AERIAL TRANSPORTATION SOLVES PROBLEM FOR WELDER

Upper left—Getting ready for the trip. Lower left—On the way over. Right—the truck lowered to the job. In the foreground are seen a steam hammer and material to be cut and welded.

there must be some way of overcoming the difficulty and he found that way.

It was a case of having to think quickly. He knew that a hoisting and conveying cable was being used in connection with the building of the lock and he thought he would thus get his truck to the scene of action quickly and with comparative safety. A minute on the telephone and he had made the necessary arrangements.

The illustrations show, first, workmen

arranging the cable to be attached to the side of the truck, and, second, the truck, after it had been raised high above the ground, starting out on its journey through the air, the proprietor himself enjoying a unique experience. The end of the line, as well as a steam-hammer and some other material to be cut and welded, are shown in the third illustration. The advertising received was well deserved and it helped to build a reputation for dependability.

Checking Construction Plans for Safety

By B. F. McMURCHY

Construction Engineer, Ohio Industrial Commission, Columbus, Ohio

A SET of plans may be checked for the method of constructing a given project, but the job superintendent generally erects his equipment as needed. Much of his equipment is temporary and is discarded each time it is erected. Therefore, on construction work the safety engineer's field lies largely in educating the workmen and in guarding the hazards as they appear, whether in temporary structures such as scaffolds or in the uncompleted permanent construction such as vertical openings. There has been little advantage gained on the check of the plans and specifications of the structure by the safety department of the contractor, as generally the hazards are easily detected as the work progresses and are just as easily guarded.

The contractor then is concerned in a safety sense with the hazards he creates and over which he has direct control. He has little voice in the preparation of the plans and specifications of the project he contracts to build. The greater value of the safety check of the plant lies outside the construction field.

The various states and municipalities through their building departments have been checking building plans for safety since their inception. They are guided by laws which cover only the more evident hazards affecting group safety and loss of life and property by fire in buildings of a public character. These departments generally are inadequate to handle the volume of work required of them and the codes, where such are in effect, are in most cases very lenient in their requirements pertaining to safety of the individual.

Except in cases of very apparent error, the strength of the structure is rarely checked. To do so on every set of plans submitted would occasion a force of engineers prohibitive in size and would require more time than would be tolerated by the owners. As a result the plans, when checked, receive an inspection for the more evident fire and accident hazard such as

type of construction, number and location of exits, size of material of walls and other items affecting the safety of groups in case of fire or panic, but the hazards of a less evident nature are not checked, nor in all cases are they provided for in the building codes which must be used by the building departments as guides for inspection.

In view of the paucity of adequate inspection facilities on the part of the government and possible inefficiency brought about through changing administrations, this work, if done at all, falls to the safety department of the concern for whom the structure or layout is designed. The safety engineer detecting the more common hazards can use known methods of guarding them. He may be able to foresee conditions that might prove hazardous which have never been encountered previously, and he may even devise adequate guards for them, but he cannot be expected to find all such conditions nor is he in a position to suggest radical changes in design or operation to eliminate hazards unless thoroughly trained, because of the technical problems involved.

Safety Education in Engineering Schools

A report of the Committee on Safety Education in Engineering Colleges of the American Society of Safety Engineers, presented to the National Safety Congress, was the basis of a pamphlet, "Accident Prevention and the Engineer," published by the Council, which gives under the subhead "Practical Methods" a list of colleges and universities giving safety instruction to their students.

Of these, perhaps Pennsylvania State College is foremost in that it has inaugurated a safety course as part of its engineering extension curricula, reaching a large number of extra-mural students who are actually in the production field as executives or workmen. The safety courses on the campus involve lecture courses on safety

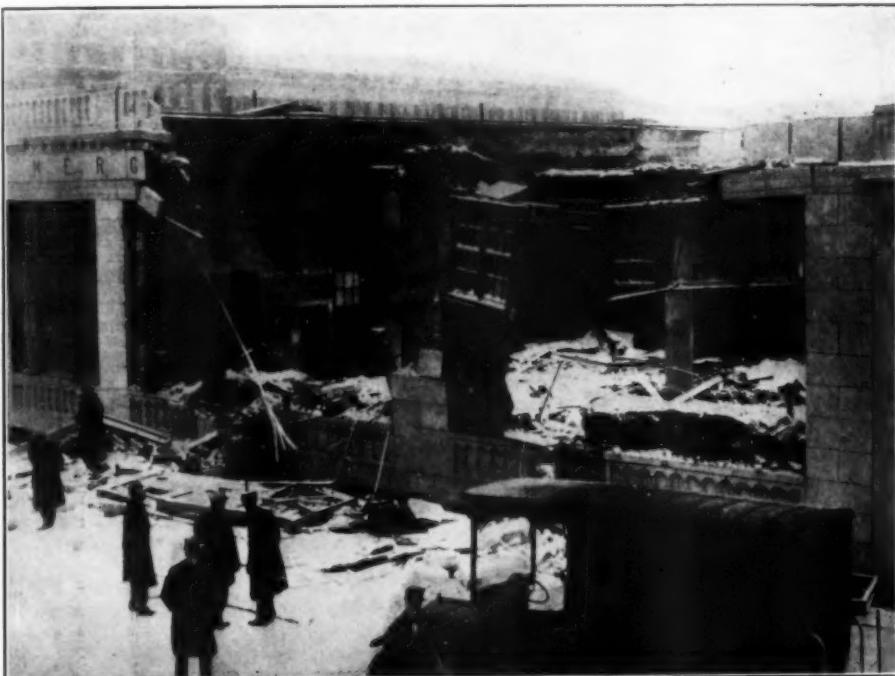
subjects, the discussion of safety laws and codes, the theory and practice of compensation insurance, the compilation and analysis of statistical records, sanitation, health, safety inspection and insurance rating.

This represents a significant step in the right direction to the ultimate elimination of many accident hazards so that humanity in the future may profit by past experience. However, the work is only started. Engineers have given to America practically every comfort and convenience in a material sense, but in so doing have created conditions from which arise 23,000 deaths, 570,000 accidents involving a time loss of four weeks or more, and 3,000,000 no-time-loss accidents, every year in the

United States, according to the findings of a survey given in "Wastes in Industry." These involve a time loss of some 50,000,000 days and a loss in wages alone of \$1,180,000,000. If the engineer created the hazards, the engineer must eliminate them, to the end that all men may live to enjoy the fruits of their labor. The problem of accident prevention resolves itself into a matter of human engineering, educating the worker in safe operation of the ideal machine in the ideal plant. When both of the latter are accomplished, we shall see the beginning of the day when our accidents will not be counted in thousands, but in hundreds and less.

ACKNOWLEDGMENT.—From a paper read before the National Safety Council.

Failure to Protect Concrete in Winter Caused this Collapse in Boston



International Newsreel Photo

THIS PHOTOGRAPH SHOWS AN UNFORTUNATE BUILDING COLLAPSE WHICH OCCURRED ON THE PENWAY IN BOSTON

Fifteen workmen narrowly escaped death or serious injury when the structure caved in. According to Louis K. Rourke, Building Commissioner, Boston, Mass., the Building Department immediately made an investigation of the collapse of this structure at 1310 Boylston Street, the result of the investigation convincing the Commissioner that the shores and braces of the roof slabs were removed contrary to the orders of the inspectors of the Building Department, before the concrete had set. This adds another case to the history of unfortunate winter construction where contractors fail to take proper means for protecting structures and do not comply with building department orders.

Oldest Concrete Pavement Still Going Strong

By EARLE DUFFY

ALTHOUGH in service for thirty-three years, a piece of the oldest concrete pavement in the United States has withstood the tremendous pressure of 5,400 pounds per square inch. The great strength of this concrete is probably due to the unconscious use of a physical law which is common knowledge to-day. The builder of this pavement, which is still in use at Bellefontaine, Ohio, used only enough mixing water to make the concrete mix workable. Since that time the water-cement ratio law has been developed. By this law the strength of concrete is determined solely by the ratio of the volume of mixing water to the volume of cement, so long as the mixture is plastic and can be worked without much trouble. The aggregates, of course, must be clean and sound.

When W. T. G. Snyder built the Bellefontaine pavement in 1894 there was not much general knowledge concerning the proper way to use cement. This makes the achievement of Mr. Snyder all the more remarkable.

The pebbles used were from $\frac{1}{4}$ to 2 inches in diameter. The slab was laid in two courses. For the bottom course 18 sacks of cement were mixed with 104 cubic feet of aggregate, making a mixture of about 1:2:4. Six inches of this bottom course was deposited on a 2-inch



CUBE CUT FROM 33-YEAR-OLD CONCRETE PAVEMENT

Note good distribution of coarse aggregate throughout pavement. This block was cut from the first concrete pavement in America laid in Bellefontaine, Ohio, before the development of present concreting methods

rolled stone base and tamped until it was 4 inches thick. Then a 2-inch 1:2 mortar top was spread on the base and heavily tamped, making a 6-inch pavement.

The materials were given a preliminary mixing by hand, in boxes. They were further mixed and water was added in a continuous mixer. Both base and top course were so dry that only a little moisture came to the top during the operation of tamping.

The high quality concrete obtained by Mr. Snyder bears out the importance of not using too much mixing water, the thing which is given chief consideration in the water-cement ratio law.

By using the water-cement ratio law, a New York construction corporation saved 15 cents per cubic yard of concrete on all construction in one year. The gross saving was about 35 cents per yard, but the cost of testing concrete and controlling it by this method amounted to about 20 cents per cubic yard.

In building the five-story structure in which the Portland Cement Association of Chicago is housed, compressive strengths for the concrete of 3,000 pounds and 2,000 pounds per square foot for 28 days were specified for structural members. To obtain these strengths 6 gallons and 7.5 gallons of water, respectively, were used for each 94-pound sack of cement. The moisture in the aggregates was taken into consideration in computing the water ratio. Tests made from time to time revealed that the strength of the concrete was quite accurately predetermined.



PIECE OF CONCRETE FROM OLD CONCRETE ROAD IN TESTING MACHINE

When tested, this concrete withstood a pressure of 5,400 pounds per square inch. Its good condition was further illustrated by its uniform failure in the machine

Quantity Surveying and the Engineer

By C. L. WEEKS

Vice-President, American Institute of Quantity Surveyors

QUANTITY surveying is the science of measurement and tabulation as applied to a structure. It has a further meaning which is perhaps better expressed by "quantity survey system." Quantity survey system is a method used in bidding on construction work in which the bidders are furnished with an instrument of purchase, listing the qualities and quantities of material and labor so that all may bid on the same items, thereby limiting competition to pricing alone and eliminating variations in qualities and quantities.

Professional quantity surveyors are those accepting commissions not only from contractors, but also from architects, owners, or any others who may have occasion to employ them in matters where quality and quantity and their costs are involved. The services of professional quantity surveyors can now be obtained in nearly every large city.

It has been suggested that construction surveyor would be a more explicit term than quantity surveyor. It remains to be seen, however, whether this name will supersede the one already in use.

Reasons for Quantity Surveying

Quantity surveying or the quantity survey system is logical and desirable. Its eventual adoption is inevitable, if this country continues to progress and conditions of human welfare improve, because:

(a) It results in economy, by the conservation of physical and mental labor and its equivalent intrinsic value, by doing away with duplicated effort in preparing surveys for the purpose of making up a bid. It enables the buyers to get material at a lower cost because it furnishes positive knowledge of what and exactly how much is needed.

(b) It creates fairness in competition and does away with special privileges, for it resolves contracting to a buying and selling proposition.

(c) It encourages honesty by exposing the facts otherwise unknown to the purchaser.

(d) It brings about efficiency in design. The plans and specifications are necessarily checked from a cost point of view and corrected before being placed in the hands of the contractors.

(e) It brings harmony between the owner and contractor. The need for extras is reduced: Thereby the construction proceeds on a smooth basis.

(f) It speeds the work to satisfactory progress, because the materials come to the site when and of the quality and quantity needed, through positive knowledge in ordering.

Opportunity for Engineers in Quantity Surveying

Civil engineers are best qualified because of their training to develop quantity surveying to a high degree of efficiency, through recognizing its principles and by placing it on a proper working basis. Engineers can find opportunities in this enormous new field of endeavor. They can, by making quantity surveying an exact science to the engineering profession, control all estimates in both architectural and engineering construction. Other branches of work open to quantity surveyors are in the field of appraisals on all kinds of buildings, for proof of loss

Other Discussions of Quantity Survey in This Magazine

<i>Savings to Contractors by the Quantity Survey</i>	January, 1927
<i>Quantity Survey</i>	January, 1927
<i>Who Pays the Bill?</i>	January, 1927
<i>Efficient Insurance Against Unreliability</i>	May, 1926
<i>Benefit of Quantity Surveys</i>	April, 1925
<i>The Value of Quantity Surveys</i>	January, 1925
<i>Use and Value of the Quantity Survey</i>	November, 1922

in case of fire, underwriting bond issues, bank loans, property settlements, sales or mergers, and taxation; valuations of improvements in condemnation proceedings on street openings and widenings for the improvement of traffic conditions; obtaining property for schools, civic centers or other purposes; and arbitration or expert testimony in public or private legal controversy over building construction.

Quantity surveying offers a solution in the employment problem of engineers. It opens a new opportunity to the younger men to increase their proficiency, and thereby help to avoid the misfortune of unemployment. In the immediate years to come properly trained quantity surveyors will be amply supplied with all the work they can do.

Work to Be Accomplished

In order to develop a workable American system of quantity surveying to secure the recognition of the construction industry and to place quantity surveying on a practical basis in this country, it will be necessary to:

1. Develop uniform methods of measurement and tabulation. In other words, to standardize and make quantity surveying function smoothly and cost accounting data reliable. To do this it will be necessary to smooth out differences in methods of measurement and terms employed. The American Institute of Quantity Surveyors has undertaken this work which is so important and stupendous a task that the Institute is asking the cooperation of engineers, architects and contractors thro'ghout the country. Its membership, Fellow, Associate or Affiliate, is open to everyone connected with the construction industry.

2. Develop scientific methods that will facilitate the practice of estimating, ordering of material and cost accounting to such a degree that the new methods will naturally be adopted in place of present inefficient ones. A simple, but scientific method of expressing the items of finished work is needed at the present time, similar to the list of items used in engineering practice but developed so as to be applicable to complicated types of building construction. This problem will be worked out eventually in such a manner that all criticisms of quantity survey systems now used in other countries, which are claimed to take as long to prepare as to build the building, will be satisfactorily met.

3. Separate the profession of quantity surveying from the professions of architecture, structural engineering and the business of contracting, in order to make it a distinctive profession that will attract the highest type of men in its development and progress.

What Engineers Can Do to Further Quantity Surveying

Quantity surveys are now being furnished and used for railroads, bridges, highways, streets, water-works and sewer construction as a basis for unit price contracts, on the greater part of engineering works in this country.

Furnishing surveys without agreeing to pay for the item on the basis of the unit prices submitted or without making the survey a part of the contract, renders a good work useless. To put a clause in the specifications saying that the

survey is only approximate and not guaranteed to be correct, necessitates that the contractor prepare his own survey. This not only destroys the value of the original survey, but renders the time expended in its preparation a waste of energy and money, because it does not eliminate the element of risk contingencies which always increase the cost of construction work by adding to the amount of the bid in the form of actual contingency allowances or in the percentage of profits.

A clause similar to the following should be used in all cases:

"A quantity survey is furnished with the plans and specifications. It is intended to list all qualities and quantities of work required in the usual units of measurement, to be priced by the contractors in order to furnish a basis for comparison of bids. The unit prices will be used to govern payments for additions or deductions to the work as called for by the plans and specifications and, if it is found that there are errors or omissions in the items given by the survey, adjustment shall be made and the contractor will be paid on the basis of the unit prices submitted for the items actually involved."

In some cases the engineer may be compelled by legal restrictions to award the contract upon a lump sum bid. In such cases he may be obliged to use a clause similar to:

"The acceptable contractor will be allowed the opportunity of checking the items furnished in the survey before signing the contract and adjustments shall be made to cover any corrections found to be necessary and agreed upon."

Cost of Quantity Surveying and How It Is Paid

It can readily be seen that this service to the owner will greatly reduce the cost of his construction work. To get the best results this work should be prepared by professional surveyors who are making it their life work and should be paid what they are worth. The cost of surveying ranges from 25 to 50 per cent of the cost of designing a structure. A surveyor's fee may be paid direct by the owner, incorporated within the fees of the architect, or may be specified to be included within the contract of the successful contractor and be paid for by him just as he pays the cost of bond or insurance premiums. It should never come out of the architect's or engineer's fees.

A quantity survey should include a complete schedule of all materials and labors required to execute the work, and should contain sufficient information to give a complete mental picture of the entire project.

The Care of Tires for Motor Trucks

An Important Item in Truck Maintenance

To insure a profit in truck operation, every operating cost must be carefully controlled.

One of the most important items is the cost of tire equipment. Fortunately, much can be done toward keeping down tire costs through observance of a few simple rules of tire care.

Proper Truck-Tire Equipment

There is naturally a wide range in the character of service demanded of motor trucks, necessitating at least three distinct types of tires; solid, cushion and pneumatic. Each of these has limitations and no one type can serve all trucks with maximum efficiency and economy. The size of the vehicle, the kind of work, the character and condition of roads, as well as the speed required, are all influential in determining the tire equipment needed. This is a question which the average owner or driver cannot always determine for himself. He should consult a reliable tire dealer who knows the kind of work the vehicle is doing and who can suggest the correct type of tire for it, based upon his knowledge and experience.

Overloading

Overloading is the most expensive of all truck-tire abuses. It exceeds by a wide margin all other forms of abuse combined and costs the owners millions of dollars annually which could be saved if reasonable care were taken in keeping within proper loads. When used under loads for which they were designed, truck tires have the stamina to deliver satisfactory and economical service, but if loads in excess of the rated capacities are carried, premature failure of the tires will result.

The proper loading of a truck does not merely mean keeping the load down to its rated capacity. A 3-ton truck, for example, may be carrying a load of only three tons and yet some or all of the tires may be overloaded, for reasons such as the following:

1. The use of unusually heavy bodies.
2. Abnormal overhang of body over rear axle, throwing excessive load on rear tires.
3. A load projecting far out over the rear end of the chassis, such as lumber, iron pipe, structural steel, etc., thus overloading the rear tires.
4. Improper distribution of heavy material so that most of the weight is

carried by one or both of the rear tires.

5. The use of a truck on hills so steep that the tilt of the vehicle or the "drift" of the load throws an overload on the rear wheels going up-hill and on the front wheels going down-hill.

6. The shifting of the bulk of the load onto the right-hand tires, owing to the crown of the road, causing the right-hand tires to wear out more rapidly than those on the left side.

When the truck tires are constantly overloaded, the tire body is crushed and broken down, resulting in rapid failure. In addition to that, overloading greatly magnifies injuries caused by running over holes in the pavements, rock, glass, or other sharp objects.

Overloading Solid Tires

When a solid tire is under load, the part in contact with the pavement becomes distorted. A tire can withstand a certain amount of distortion, but if the load is sufficient to distort it beyond its limit, the rubber will break down and the tire will fail.

When under an excessive load, the tire will bulge out along the side on every turn of the wheel until finally the strain causes a spreading of the rubber just above the steel band. This is technically known as "undercutting." Then follows the breaking away of strips and chunks of rubber between the shoulder of the tire and the rim base, making the tire unfit for further service.



UNDERCUTTING OF SOLID TIRE



SECTIONS OF OVERLOADED CUSHION TIRES

The strain of overloading is also likely to affect the union between the rubber and the base band, causing separation. This breakdown process is likely to be slow and the effects are always unnoticeable in the beginning. The first indication of an overload is seen in the appearance of a line extending circumferentially around the tire, just above the rim, followed by a definite widening of this line into a crack, which gradually works inward and upward, resulting in undercutting. Therefore, adequate precaution is essential if this difficulty is to be avoided. Overloading need not be continuous to ruin a tire. One excessive overload may do it.

Overloading Hollow-Center Cushion Tires

The effects of overloading on cushion tires are about the same as on solid tires. In some cases there will be a separation of the rubber and the steel base, while in other cases cracking of the sidewall to the hollow center will result.

Cushion tires flex more easily and more quickly than solid tires when passing over uneven places in the road. While providing greater cushioning qualities, however, the construction of the tire also causes the results from overloading to develop sooner than in the case of solids.



CARCASS BREAK OF CORD TIRE

In changing from solid to hollow-center construction tires, it is generally necessary to use a hollow-center tire one size wider to carry the same load. For example, a 4-inch solid tire should be replaced with a 5-inch cushion, assuming that the tires are required to carry only normal loads.



SEPARATION OF TREAD FROM CARCASS

Overloading Pneumatic Truck and Bus Tires

Pneumatic tires will give best service under the respective loads shown in the accompanying schedule, provided the recommended air pressure is maintained in the tire at all times. Loading a pneumatic tire beyond its rated carrying capacity is certain to lessen the life of the tire, even if the proper air pressure is maintained. Excessive loads cause the tire to flatten and subject the sidewalls to an excessive bending action. This sharp bending of the sidewalls localizes the strain and finally causes the cords to break at that point. This break in the casing may pinch or chafe the tube and cause a small leak or, if the cords are badly weakened, a large blowout may occur.

Overloading may also cause the tread to work loose from the carcass at or near the ends of the tread design, owing to the shearing action set up at these points. This eventually results in complete separation of the tread rubber from the fabric carcass, totally destroying the usefulness of the casing.

For all these reasons, it is especially important that loads on pneumatic truck tires do not

exceed the weights recommended and that the actual loads be determined by weighing the truck under full load.

Under-Inflation of Pneumatic Truck Tires

No one factor is as vitally important to the life of a pneumatic truck tire as proper inflation. It is the air within the tire which carries the load. The tire merely acts as a container. Considering the tons of weight that truck tires must carry, it can easily be seen that the air pressure must be kept right or trouble will result.

When a tire is under-inflated it bends sharply in the sidewalls at every revolution. This constant action finally causes the cords to break. Then the tube is pinched and goes flat. Under-inflation also lowers the tire's resistance to other injuries such as bruises, cuts, etc. Since inflation is the most important factor in good tire performance and therefore reduces tire expense, it is essential:

1. That the pressure schedule be adhered to.
2. That the pressure in each tire be checked often enough to be sure that the pressure is maintained constantly. This may require testing every week, or even every day, depending on conditions.
3. That to guard against loss of air through the valve, a valve cap be properly applied on every valve.

Selecting Proper-Size Truck Tires

Some operators, either from choice or in emergencies, frequently carry loads in excess of the carrying capacities of the tires. Such operators can obtain relief from tire troubles by changing to a larger tire which will be adequate for the maximum loads carried. Although the original cost of the larger tires will be greater, the use of those tires will result in a lower cost per mile. To select the right-size tire, determine first the maximum load to be carried by the tire by weighing the full-loaded truck as follows:

Drive the front wheels onto the scale, and stop when the center of the chassis has reached the edge of the scale. Note the weight registered. Divide the weight by two to obtain the load carried by each front tire. Then weigh the rear end in a similar manner to determine the load carried by each rear tire. If this is properly done, the sum of the weights per wheel will approximately equal the total weight of the truck and the load.

Tire manufacturers have found that the following schedule of carrying capacities of truck tires by size and type is the most liberal that

A Code of Tire Care

1. Do not allow your truck to be overloaded. See that the load is equally distributed.
2. Watch the inflation in pneumatic truck tires. It should be checked every day and maintained at the recommended pressure.
3. Check your wheels regularly for misalignment and other wheel irregularities.
4. See that the brakes are evenly adjusted.
5. Stay out of car tracks.
6. Drive slowly over rough pavements. Avoid the bumps when possible.
7. Trim off slivers of solid and cushion tires. In pneumatics, have the cuts vulcanized.
8. Do not use chains unless necessary. Remove them as soon as they are no longer needed.
9. Do not permit excessive speeds.

can be recommended if the tires are to give maximum service:

INFLATION PRESSURES AND CARRYING CAPACITIES

Minimum Inflation Pressure (Lbs.)	Pneumatic Tires							
	4½	5	6	7	8	9		
in.	in.	in.	in.	in.	in.	in.		
60	1050							
65	1150	1325						
70	*1250	1450	1700	2100				
75	1350	1575	1825	2250				
80		*1700	1950	2400	2950			
85		1825	2075	2550	3125			
90			*2200	2700	3300	3800		
100			2450	*3000	3650	4200	4650	
110					3300	*4000	4600	5100
120						4350	*5000	5550
130							5400	*6000
140								6450

* These figures represent the maximum load with the designated minimum inflation pressure which is recommended as safe practice. Higher loads and pressures are shown only for the convenience of those who wish to disregard the recommended limits.

CARRYING CAPACITIES OF SOLID TIRES

Tires	Maximum Load Carrying Capacities per Wheel					
	Cross-section dimensions..	8 in.	8½ in.	9 in.	10 in.	11 in.
Diameters 36 in. or less..	1000	1300	1700	2500	3500	
Diameters 38 in. and 40 in.					3000	4000

Tires	Maximum Load Carrying Capacities per Wheel					
	Cross-section dimensions..	8 in.	8½ in.	10 in.	12 in.	14 in.
Diameters 36 in. or less..	4500	5500	7500	9500	11500	
Diameters 38 in. and 40 in.	5000	6000	8000			

In cushion tires the next size larger than the solid type should be used.



"BLOWOUT" IN SOLID TIRE CAUSED BY SPEEDING

Speeding

Running a truck at excessive speeds is much more costly than the average operator realizes. It magnifies every bump. If the speed is doubled from ten to twenty miles per hour, for example, the force of each jolt will be multiplied four times.

As a tire rolls over the ground the part which comes in contact with the pavement naturally is flattened and distorted. As it leaves the ground the tire springs back to its normal shape. This action causes internal friction and heat. When the tire is run at ordinary speed, the heat produced will not be destructive. But when the speed is greatly increased the distortion and release of the rubber takes place rapidly. Moreover, the force of the impact with the road is more severe. As a result, the tire sometimes becomes heated to such an extent that the rubber is damaged and the tire fails.

In the case of solid or cushion tires, the internal heat sometimes develops to such an extent that the rubber in the center of the tire softens and forms gas which bursts through the surface, causing what is generally called a blowout. These conditions are most likely to develop in tires used on long hauls at high speeds under full loads or overloads.

Sharp objects encountered at normal speeds may do very little harm, but when struck at an excessive speed they will often gouge and tear the rubber and even the carcass of the tire. The severe bumps and jolts experienced while speeding will occasionally

bend the steel base of a solid or cushion tire or crack the layer of hard rubber which lies between the tread rubber and the steel base. This is soon followed by separation of the tread from the base band. To avoid these injurious effects, operators should see that excessive speed is not permitted.

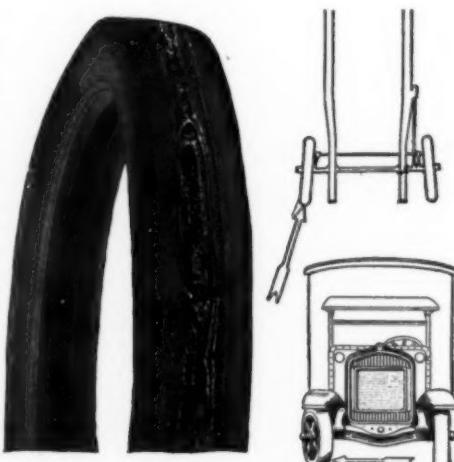
Solid tires are designed for use at comparatively low speeds. They provide ample cushioning qualities at reasonable speeds, but when run at excessive speeds, damage to the truck and tires is bound to follow.

Cushion tires, on account of their hollow construction, cut down the vibration of the truck and do not generate heat so rapidly as solid tires. Consequently, they can be run at a somewhat higher rate of speed. If excessive speeding is practiced, however, trouble will result.

If it is necessary to run constantly at speeds higher than those which are safe for solid or cushion tires, then pneumatic tires should be used. They are specially designed for service requiring a minimum of vibration as well as a fair rate of speed. A fast trip with an empty truck for a short distance may do no harm, but fast, long hauls with heavy loads are practically certain to cause trouble.

Cause of Rapid Tread Wear

In spite of the tough wear-resisting rubber compounds that are used by responsible tire manufacturers, solid, cushion and pneumatic



WHEEL IRREGULARITIES AND THEIR EFFECT ON A PNEUMATIC TIRE



THE EFFECT OF WHEEL IRREGULARITIES ON A SOLID TIRE

tires are sometimes subjected to operating conditions that will cause the treads to wear away rapidly.

The causes most often responsible for too rapid tread wear are the various forms of wheel irregularities such as misalignment, improper camber, or unevenly adjusted brakes. These conditions may be brought about by such things as bent axles, bent steering knuckles, a loose bearing, a broken spring, a bent spindle or anything which prevents the wheels from tracking properly. Excessive brake application, spinning of the wheels, or a rim unevenly placed on a wheel, will also cause undue tread wear.

A tire which does not run true drags with a side motion as it revolves. This has about the same effect as rubbing the tread with a file and the rubber is worn away very rapidly.

Where there is any evidence of premature tread wear, it is well to have the running gear thoroughly inspected for any irregularities such as those listed above. In fact, it is good policy to have such inspection made occasionally to guard against these troubles.

Front wheels, in order to be in proper alignment, must be set closer together at the front than at the rear so that when they swing back or spread as the truck is in motion, they will run parallel. Proper alignment of the rear wheels consists merely in having the rear axle at right angles to the frame and the wheels parallel.

Wobbly wheels caused by loose spokes and bearings or unevenly fitted rims, give the tires an irregular and uncertain contact with the road. As a result, the tread rubber will wear down prematurely in spots. Warped wheels which do not form a true surface subject the tire to a pounding action, causing uneven wear or sometimes, in the case of solid or cushion tires, separation of the rubber from the steel base or the breaking of the band itself.

Rapid tread wear is also caused by unevenly adjusted brakes, skidding, sliding and spinning of the wheels, sharp turns, starting with jerks, or anything else which results in abnormal friction be-

tween the tire and the road.

Bodies, fender bolts or projections of any kind should be clear of the tires at all times so that they cannot scrape or gouge the rubber away. An empty truck may have plenty of clearance, but when loaded the body may sag sufficiently to scrape the tires as it passes over the uneven places in the roadway. This snags and tears the rubber.

Car-track riding is a very serious abuse and the cause of much uneven, premature tread wear. All the weight and wear is concentrated on a small part of the tire where it meets the edge of the rails. After part of the tread width is worn away by the car tracks, the remainder cannot successfully carry the load and do the work that the whole tread should have done.

In the case of pneumatic truck tires, considerable strain is borne by the carcass beneath the tread. As a result, this part of the tire is overtaxed and the layers of cords separate and chafe, causing premature failure.

Systematic care, to assure even alignment and free roll of the wheels, combined with common-sense driving, will prevent abnormal tread wear and will give tires the opportunity to deliver the complete profitable service of which they are capable and for which they were built.

Tread Cuts

Often sharp stones, pieces of glass, bits of iron, a switch point and other similar objects



THE EFFECT OF A WOBBLY WHEEL ON A SOLID TIRE



THE EFFECT OF A WOBBLY WHEEL ON A PNEUMATIC TIRE

will cut even the toughest tread when struck sharply. This is true with all classes of truck tires. The ultimate effect of a cut depends upon its size and location. Cuts near the edge of solid and cushion tires are the most injurious and if neglected will seriously affect the life of the tire. There is always a tendency for such cuts to enlarge, especially in a circumferential direction. The sliver should be entirely cut off at an angle as soon as it appears. This prevents the possibility of its spreading. If a sliver is left uncut, it will contribute nothing to the strength of the tire, but will continue to flap and the tear will extend itself until half the tread width is torn loose. The weakening of one unit of a dual tire throws an overload on its mate at the point of the injury.

Tread cuts occur in pneumatic tires from exactly the same causes as cuts in solid and cushion tires, but there is more necessity for watching these tires carefully and

keeping their treads in good condition, because the damage to the tire through growth of the cut is greater; in fact, the total destruction of the tire may result from allowing the small tread cuts to go unattended.

Dirt and small stones work into neglected cuts through the tread to the body of the tire, causing the tread to loosen. This results in the cord plies losing their rubber protection. Water then has an opportunity to enter and to rot the cords, thereby weakening them and in all probability causing a blowout. Tread cuts should be instantly vulcanized.

Rough Roads

On a road with a rough surface, the tire



THE EFFECT OF CAR-TRACK RIDING ON A PNEUMATIC TIRE



TREAD CUTS ON A SOLID TIRE

rests successively on irregularities which have the same effect as overloading that particular portion of the tire. Continual running on such roads will cut out pieces of rubber and in time render the tire useless. Ruts are particularly injurious to pneumatic tires, especially when the roads are frozen. They scuff and scrape the sidewall, removing the rubber and exposing the carcass. Sometimes this action is so severe that the layers of cord in the carcass are torn and a blowout follows. Bad roads should be avoided when possible as they shorten the life of the tires.

Anti-Skid Devices

Some anti-skid devices are injurious to tires. Whenever they are used, there is always the probability that they will cut and tear the rubber, thus shortening the



(at left)
THE
RESULT OF
CAR-TRACK RIDING
ON A SOLID
TIRE



(at right)
A
SOLID-TIRE
TREAD NOTCHED
TO STOP A
SLIVER FROM
SPREADING



(at left)
THE
INEVITABLE RESULT
OF A
NEGLECTED TREAD
CUT

life of the tire. There are two general types of anti-skid devices, those that creep when properly applied and those which are fastened rigidly to the wheels.

Of the two, the type that is fastened rigidly to the wheel is the more injurious since the strain is continuously exerted at the same contact point on the tire. The constant pounding against the tread makes even deep cuts across the tire. The creeping type of chain must be

applied loosely enough to permit the chains to move slowly around the tire as the wheel revolves. If applied too tightly they will chafe the tire.

Careful Driving

Practically everything that has been said in the foregoing pages can be summed up in two words—*careful driving*. Whether you get good service or poor service from your tires, depends very largely on the driver. A careful



(at left)

THE
EFFECT OF
ROUGH ROADS
ON TREADS OF
PNEUMATICS



(at right)

RUT WEAR
ON THE SIDEWALLS
OF PNEUMATICS



(at left)

THE
EFFECT OF
ROUGH ROADS
ON A SOLID
TIRE



(at left)
CHAIN CUTS
ON A SOLID
TIRE



(below)
CHAIN CUTS
ON A PNEUMATIC
TIRE

driver can save the owner hundreds of dollars. A careless one is costly. It is highly important, therefore, that the owner should see that the driver understands how to obtain the most efficient service from the tire equipment.

ACKNOWLEDGMENT—Prepared from material furnished through the courtesy of the Rubber Association of America, Inc., New York City, which also furnished the illustrations that accompany this article.

News Notes

Third Annual Outdoor Road Show

THE Massachusetts Highway Association has announced its Third Annual Outdoor Road Show, to be held May 11 and 12, 1927, on the site of the two previous shows, at the Cottage Farm Bridge and Memorial Drive, Boston, Mass. President John A. Gaffey of the Massachusetts Highway Association is the Director-General of the Show, and John M. McCarthy is Secretary. The Directors are Fred W. Mattheis, Hedge & Mattheis Co.; C. F. Reuter, Mead-Morrison Manufacturing Co.; B. J. Surrett, Dyer Sales & Machinery Co.; James J. Tobin, Granite Paving Block Association; L. F. C. Bryant, Buffalo-Pitts Steam Roller Co.; Fred D. Richardson, Superintendent of Streets, Brookline, Mass.; and F. C. Pillsbury, Massachusetts State Engineering Department.

Florida Engineering Society

AT the Eleventh Annual Meeting of the Florida Engineering Society held at Clermont, Fla., George W. Simons, Jr., Jacksonville, was elected President; C. A. Brown, Orlando, and J. E. Craig, Jacksonville, Vice-Presidents; J. R. Benton, Gainesville, Secretary, and G. A. Main, Daytona Beach, Treasurer.

Papers treating of "City Planning in Florida," by Charles Wellford Leavitt; "Engineering Consciousness," by H. D. Mendenhall; "Pressures Back of Sea-Walls," by C. H. Ruggles, and "The Control of the Kissimmee River," by C. C. Brown, were read and discussed.

New Atlas Mixer Distributors

THE Atlas Engineering Co., Milwaukee, Wis., has announced the appointment of the following distributors for Atlas mortar and plaster mixers: Henry H. Meyer Co., 110 South Howard Street, Baltimore, Md., and 1114 Ninth

Street, N. W., Washington, D. C.; Interstate Machinery & Supply Co., 1006 Douglas Street, Omaha, Nebr.; Wm. H. Ziegler Co., Inc., 619 Washington Avenue, South, Minneapolis, Minn.; and the Havana Fruit Co., Havana, Cuba.

Northern Conveyor Opens Albany, New York, Office

THE Northern Conveyor and Manufacturing Co., Janesville, Wis., has announced the opening of a permanent office at 36 State Street, Albany, N. Y., under the direction of H. E. Whitnall, Vice-President of the company. Mr. Whitnall and his family will move to Schenectady, N. Y., where he will take charge of the New York and New England agencies of the company. On his last return from the east, Mr. Whitnall reported that the New York State Highway Department had awarded him a contract for eleven machines. After this order is filled, the department will have fifty-four Northern conveyors in operation.

Beaumont Acquires American Slackline Business

THE R. H. Beaumont Co., 319 Arch Street, Philadelphia, Pa., has announced that it has taken over the business of the American Manufacturing and Engineering Co., Kalamazoo, Mich., and will hereafter manufacture and market the product of that company, including the American slackline cableway excavator. S. O. Nafziger, President of the American Manufacturing and Engineering Co., will be associated with R. H. Beaumont Company. The addition of the American slackline cableway excavator to the Beaumont line, which already includes the Beaumont LeClair cable drag scraper, gives the Beaumont Company a full line of equipment for the elevating and storing of sand, gravel, stone and kindred materials.



METHOD OF SINKING AND EXCAVATING REINFORCED CONCRETE OPEN-WELL CAISSENS FOR FOUNDATIONS OF NEW ST. LOUIS COURT HOUSE

Building the New Four-Million-Dollar Court House in St. Louis

Foundation Consists of Sixty-two Caissons Supporting Eighty-four Steel Columns

THE new \$4,000,000 Civil Court House in St. Louis, the first unit of the city's \$15,000,000 Memorial Plaza, is taking definite shape. Since the completion of the foundation in February, work on the steel framework has been under way. Excavation and construc-



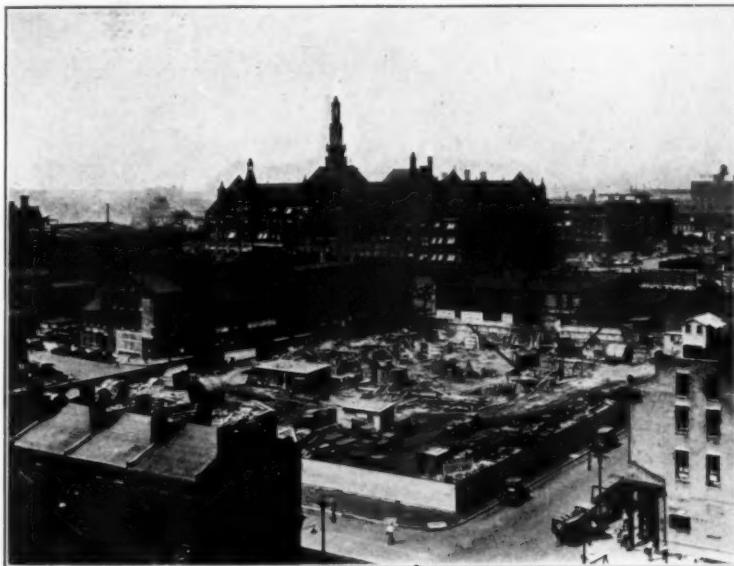
CIRCULAR AND RECTANGULAR PIERS FOR THE NEW ST. LOUIS COURT HOUSE UNDER CONSTRUCTION

tion of the concrete piers for the foundation were completed at a cost of \$283,189.88.

In excavating for the foundation, it was necessary to dig to a depth of 40 to 55 feet to reach solid rock. Some difficulty was encountered in sinking the caissons as many boulders were found on top of the rock. Aside from this, however, excavation for the foundation was carried on with little difficulty. Virtually no quicksand was encountered and all the caissons were worked without air. They were sunk at an average rate of one a day.

The excavation consisted of sinking sixty-two concrete caissons which, when sunk to the required depth, were filled with concrete. These

so that there will be virtually twenty-three stories. A replica of a Grecian temple, topped with an Egyptian pyramid, will add to the height of the structure. The walls will rise for a height of 220 feet and their four corners will be fringed with the outstretched wings of an eagle. Above the main shaft, the Grecian temple will rise for a distance of 160 feet. A colonnade of eight Ionic pillars on each side will surround it, supporting a public promenade 245 feet above street level and thus affording an excellent view of the city. These columns will be 42 feet high and 5 feet in diameter, weighing 80 tons each. A pyramid of eleven large steps will form the roof, with two sphinxes,



PROGRESS OF FOUNDATIONS FOR ST. LOUIS COURT HOUSE

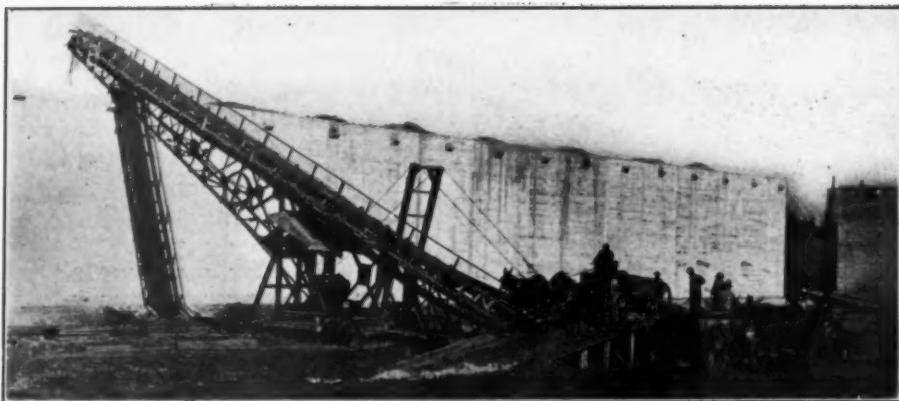
will support the eighty-four steel columns of the structure. Some of the caissons are circular, while others are rectangular. One steel column will rest on each circular pier and two on the rectangular piers. Crawler-equipped cranes with clamshell buckets were used to remove the dirt from the inside of the caissons.

Located on the block bounded by Twelfth Boulevard, Market, Chestnut and Eleventh Streets, in the center of downtown St. Louis, the new Court House will be 380 feet high—10 feet higher than the new Bell Telephone Building, St. Louis' loftiest structure up to this time. The building will be of Grecian design and each of its thirteen floors will be lofty. Twelve of them will have partial mezzanines,

10 feet high, surmounting the structure at its apex.

The base of the walls for 8 feet above the ground will be formed of granite. The remaining portion of the walls will be of white Bedford stone. Entrances will be through porticos supported by Doric columns.

The Court House is situated at the eastern extremity of the Memorial Plaza, which will cover ten blocks in addition to the space already taken up by municipal buildings. A \$5,000,000 Municipal Auditorium, bids for which were recently announced, is among the other buildings to be erected on the plaza. The buildings were provided for in the \$87,000,000 bond issue voted in 1923.



110-FOOT PORTABLE BELT-CONVEYOR USED FOR HANDLING 150,000 CUBIC YARDS OF DIRT FROM THE ST. LOUIS RESERVOIR

This illustration shows method of hauling dirt to conveyor

Giant Conveyor Speeds Building of Reservoir

About 800 Loads of Dirt Boosted Over 33-Foot Wall in 10 Hours

In building a large reservoir in St. Louis recently, it was found that about 150,000 cubic yards of earth remained inside the high wall, which was practically completed. This earth was needed outside for backfill. The most economical method of removing the dirt was found to be to excavate it and throw it over the 33-foot wall. For this purpose a 110-foot portable belt-conveyor made by the General Conveyor and Manufacturing Co., St. Louis, Mo., was used. The dirt was deposited on the belt from dump wagons, as shown in the illustration. In this way 800 loads of dirt could be carried over the 33-foot wall in a period of ten hours.

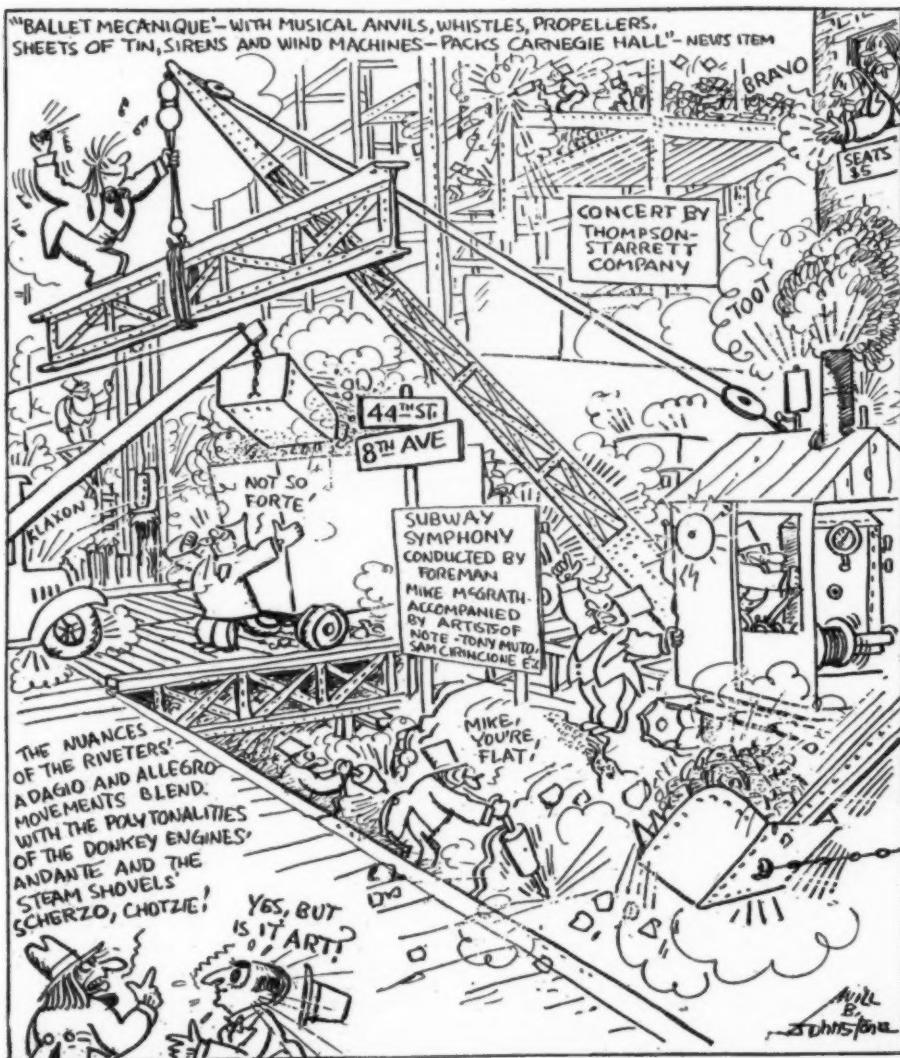
The belt-conveyor consisted of a structural steel framework mounted on a steel truck frame, using eight wheels, one pair at each corner. The 36-inch belt was operated by a 35-horsepower gasoline engine at a speed of approximately 100 feet a minute and at an angle of 25 degrees.

The Stacey Park reservoir is located fifteen miles from St. Louis, and has a capacity of 100,000,000 gallons. The reservoir is rectangular, being 600 by 800 feet, with a depth of 33 feet. There will be a roof over the entire structure. The contractors, the Frazier Davis Construction Co., St. Louis, expect to have this project completed in about two years.



MOUNTAIN OF DIRT OUTSIDE THE RESERVOIR WALL, SHOWING EASE WITH WHICH IT IS PILED AGAINST WALL FOR BACKFILL

At Last the Contractor Breaks Into Opera



Cartoon courtesy of New York World

AN ARTIST'S CONCEPTION OF THE MUSIC OF MODERN CONSTRUCTION, BASED ON THE RECENT PRODUCTION OF "BALLET MECANIQUE" AT CARNEGIE HALL, NEW YORK, WITH MUSICAL ANVILS, WHISTLES, PROPELLERS, SHEETS OF TIN, SIRENS AND WIND MACHINES

Fences Stretched to Fit

AMONG the multitude of uses for the modern tractor is the erection of wire fencing, as the tractor can stretch as many as five strands with each pull. A farmer relates this experience with woven wire fence. Having material for a 4-

foot 6-inch fence, which was too short for his needs but higher than necessary, he hitched his tractor to the fence and thus stretched the fence to the desired length. At the same time the fence was reduced to about 4 feet in height.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

The Contractor's Bank Account

A decision of the South Dakota Supreme Court in a recent case (*Holman vs. Commercial & Savings Bank*, 210 North Western Reporter, 730) draws attention to the well-settled rule of law that where a bank fails, a depositor is entitled to offset against any loans on which he may be indebted to the bank the amount to his credit as a depositor at the time of closing of the bank. In other words, he cannot be compelled to pay his loan in full and then share pro rata with the bank's other creditors as to his deposit.

In another case (*Dow vs. Stockport Savings Bank*, 210 North Western Reporter, 815), the Iowa Supreme Court decided that a depositor does not lose the right to complain against an unauthorized charging of his account with improper items through mere delay in calling for or examining his pass-book and bank statement.

Contractor's Right to Break Contract Subject to Liability for Damages

An attempt to compel highway contractors to accept and pay for crushed stone after they had given notice that they would receive no more under an existing contract gave rise to the case of *Bennett vs. Dayton*, 135 South Eastern Reporter, 13, decided by the West Virginia Supreme Court of Appeals.

The contract called for 4,000 tons of crushed limestone for use by the buyers on a state highway job. They accepted nearly 2,000 tons, but rejected five cars. The sellers sued for damages.

It appeared that three of the five cars rejected had been loaded and already billed when the sellers received notice that further shipments should be stopped. "Delivery to the railroad company was delivery to defendants" [the buyers], said the Court. "Such delivery having been made prior to the suspension order, the defendants must pay for same and for the demurrage and freight thereon."

But as to the two remaining cars the Court added: "The plaintiffs were not warranted in loading and shipping the other two cars after the positive order of defendants to ship no more stone.

"Where the buyer repudiates the contract, and says he will not accept the goods proffered to be shipped to him, it is not the duty of the seller to go to the futile expense of shipping. It is the duty of the seller to minimize the damages, and if he should incur the expense of shipment, knowing it to be a vain and useless expenditure, he would be precluded under the law of damages from recovering therefor." . . . Therefore the plain-

tiffs are not entitled to recover for the . . . two cars or for the freight and demurrage thereon."

But, of course, the Court upheld the sellers' right to recover damages resulting from the buyers' breach of their contract, as distinguished from the contract price.

Contractors' Bonds Do Not Usually Protect Lending Banks

In the absence of explicit provision in a contractor's bond for payment of laborers, materialmen, etc., a lender of money used in doing public work is not protected by the bond, holds the North Carolina Supreme Court in the case of *Murchison National Bank vs. Clark*, 123 South Eastern Reporter, 123.

And the Court Said the Materialman Was Right

"You owe me nearly \$3,000," said a manufacturer of tile to a firm of subcontractors. "How come?" asked the subs. "Well," answered the tile man, "you remember we made a written contract that I was to furnish you tile for partitions for \$300, and under another contract I agreed to furnish materials and erect a roof deck for you for \$3,035. I delivered all the materials on the job. Then you told me not to proceed with the work, because you were having trouble with the general contractor. We are sorry about this hitch between you and the general contractor, but a contract is a contract and we want to be made whole." The subcontractors reminded the tile man that he had not reclaimed the tile as he might have done, saying, "If you had done that and resold to the best advantage your damage would not be as much as you now claim."

We need not detail the rest of the conversation, because they could not see the matter in the same light, and so they went to law about it, and the case lately came before the Michigan Supreme Court (*United States Gypsum Company vs. Zacks*, 211 North Western Reporter, 22, decided December 8, 1926).

The Court decided that the materialman was right. The materials having been delivered and the time for payment having passed, there was nothing in the law to require the materialman to take the tile back. And as to the unperformed part of the contract, the tile man was entitled to recover the profits that were lost to him through the subcontractors' failure to carry out the agreement.

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distribution of steel with maximum bonding area. The closely spaced members bind the slab together as a solid unit, preventing cracks and preserving the smoothness of the surface.

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SALT LAKE CITY . . . Walker Bk. Bldg.

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*United States Steel Products
Company

Dividing Profits Does Not Necessarily Show Partnership

"Shuff, we hear that you have a contract to construct a storage pit for an oil company, and need credit to finance the work," said Gray & Young. "We will not stand liable for your payroll, but we will enable you to get the necessary materials by pledging our credit for the same, if you will agree to give us one-half of the net profits on the job." "It's a bargain," replied Shuff, and the parties signed a written contract to that effect.

Taylor sold supplies to Shuff on his own credit, apparently not knowing at the time of the contract just mentioned. The bill was not paid and Taylor sued Shuff and Gray & Young jointly, claiming that the construction contract was a partnership affair and that Gray & Young were liable as members of the partnership for the purchases made by Shuff. Taylor admitted in court that if the agreement between the three defendants did not make them partners, Gray & Young were not liable.

The Arkansas Supreme Court decided the case January 24, 1927 (Taylor vs. Gray, 290 South Western Reporter, 935), holding that there was no partnership and therefore no liability on the part of Gray & Young to Taylor. The ground of the decision is that the construction contract was between the oil company and Shuff. Gray & Young had no voice in carrying it out. The mere fact that they were to be paid a share of the profits as compensation for lending their credit did not render them liable to any one to whom they did not actually pledge their credit.

Hiring Employees Under Age

In the main, the law strives to make all parties to business contracts be sportsmanlike in their dealings. Jug-handled, heads-I-win tails-you-lose deals, are frowned upon. But there is an exception in the case of minors—an exception that is designed to prevent adults from taking advantage of minors but that sometimes enables minors to take advantage of adults.

A case involving the employment of a youth on construction work, decided November 18, 1926, (Humphries vs. Boxley Brothers Company, 135 South Eastern Reporter, 890), gave the Virginia Supreme Court of Appeals occasion for following the well-established rule of law that where a minor is employed for a specified period he can hold the employer to the letter of the contract, or recover damages for breach of the agreement; but the minor can quit, without liability, at will, with or without reasonable excuse for doing so. And, as noted by the Court, while the wages agreed upon in the contract are binding upon the employer, whether they be more or less than the reasonable value of the minor's services, the minor is not bound; he can repudiate the agreement and recover the reasonable value of the services. This last stated provision of the law is, of course, a wholesome one, in that it tends to prevent a greedy employer from taking advantage of a green youth's inability to hold up his own side in bargaining.

Associated Contractors Disagreed on Their Accounts

When whacking-up time came, partners who constructed a street improvement in Seattle could not agree on a statement of net profits. So, like all good friends of lawyers, they went to law about it. There were two rounds fought, one in the Superior Court and one in the Supreme Court. This is what both courts ruled in an opinion handed down February 1, 1927 (Brewster vs. Mattson, 252 Pacific Reporter, 689):

Where one of the members of a partnership constructing public work is authorized by his associates to borrow money to finance the work, he has implied authority to discount warrants and bonds received, provided they are not sold below their market value.

If one of the partners lends construction equipment (in this case, a steam-shovel), to the firm, rent free, he is not entitled to charge the firm with depreciation on the equipment through ordinary wear and tear, in the absence of special agreement. Nor is the firm liable for taxes accruing on the equipment.

The Legal Importance of Systematic Bookkeeping

It behooves the contractor who is to be paid for a job on the time or cost basis to keep a careful and systematic account of labor. Otherwise he may find himself "out of luck" if it becomes necessary for him to prove his claim. If it were to come to a pinch there might be difficulty, to say the least, in getting Feodor Plozck to testify how many days he worked on the job as journeyman stonemason, even if Feodor's whereabouts be ascertainable and his presence as a witness be obtainable. Feodor might not remember how many hours he did work on that job. The same difficulty would apply to all the rest of the workmen, from Leonard Verdi down to Julius Caesar Johnson.

The importance of preserving proper time records is well illustrated by the case of Johnson vs. Kusminsky, 135 Atlantic Reporter, 220, decided by the Pennsylvania Supreme Court November 22, 1926. It seems that in that case the sufficiency of a cost-plus contractors' proof of labor used was called into question, but the following extract from the Court's opinion shows that the contractors had kept themselves in the clear:

"Every workman had a weekly time card on which he made a daily entry of his hours of work. These cards were approved by the foreman, and filed with the bookkeeper at the end of the week. One of the plaintiffs [contractors] spent several hours each day on the job in question. On proof of the accuracy of the slips by him, by the foreman and by the bookkeeper, they were received in evidence without calling the individual workmen. The time cards were kept in due course of business, and when duly proved were competent evidence. Plaintiffs paid the workmen according to these cards and should be reimbursed. Charges are good if made according to the nature of the business and the usages of the trade in such business."

NINE RANSOME PNEUMATIC PLACERS For New York Subway Work



Concrete was placed vertically through this pipe—
105 feet high.

Already we have contracts to furnish nine (9) Ransome Horizontal Pneumatic Placers for this important work. In New York Subways, on jobs from New England to the Pacific Coast—in Canada, Mexico, South America, Europe and Asia—contractors and engineers are making time and saving money by using Ransome Pneumatic Placers.

The illustrations here show an important test that was made recently on the De Balso Construction Corporation's job at 183rd St. and Fort Washington Ave., New York City, before a representative body of engineers. This test demonstrated that, within reasonable limits, it is fully as easy to place concrete by the pneumatic method *vertically* as it is horizontally. The vertical height was approximately 105 ft. With an average of 70 pounds of air, it took fifteen (15) seconds to shoot a 7-cubic-foot batch.

Let us give you an idea of what Ransome Pneumatic Placers will do on your particular job, the costs and the savings—without obligation on your part. If we recommend the use of a Ransome Pneumatic, we'll guarantee its performance.



RANSOME CONCRETE MACHINERY CO.
1850—SERVICE FOR 77 YEARS—1927
DUNELLEN, Agents in All Principal Cities **NEW JERSEY**

A New Motorized Road Patrol

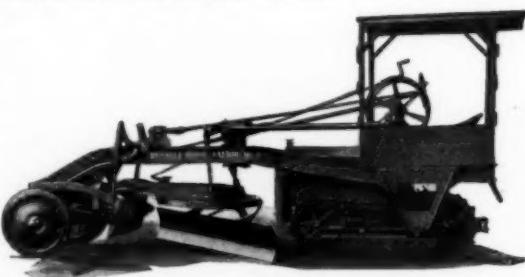
Latest Model Powered with Cletrac K-20 Tractor

THE latest-model Russell patrol maintainer, No. 5, which is made by the Russell Grader Manufacturing Co., Minneapolis, Minn., for one-man operation is equipped with blade and scarifier mechanism and powered with a cletrac K-20 tractor. The Russell No. 2 was powered with a Fordson tractor, the Russell No. 3 with a McCormick-Deering tractor, the Russell No. 4 with a Caterpillar tractor, and the latest Russell motor patrol with the Cletrac.

With the Cletrac K-20 tractor for power, this new unit is built for light and quick work as well as for heavier and slower work. Like the Russell motor patrol No. 4, the No. 5 unit is designed to insure economy, better execution, longer service as well as lower upkeep cost.

The standard length of blade with the No. 5 is 10 feet, but other lengths are also furnished. The back of the blade is reinforced by two heavy angle irons which support the blade. The circle supporting the blade is 52 inches in diameter, affording wide and rigid support. A clamping device on the circle locks the blade and prevents all play. A snug-fitting and dependable lock is an added feature.

The blade is raised and lowered by a cut worm gear which is enclosed in a machined housing, keeping it free from dirt. Bronze bushings and collars are used on the worm shaft to improve operation.



THE NEW RUSSELL NO. 5 MOTOR PATROL WITH CLETRAC POWER

Other features noted by the manufacturer are that the shafts of the lifting arms are of high-carbon steel, keyed to both gear and lifting arms; there are take-ups for wear in the worm bracket and forward left-arm bracket and ball and socket connections for the lifting links.

The center shift allows the shifting of the blade to either side of the frame. It is of a rack and pinion type, operated by worm and gear. The front wheels are 32 x 5-inch, rubber tired, with Timken bearings and a spread of 53 inches. The operator's station at the rear of the tractor gives full view. The scarifier is independently adjustable from the rear platform, working with or without the blade.

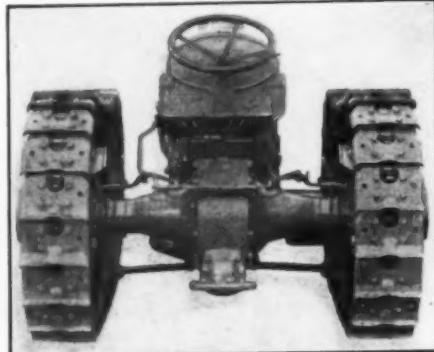
New Wide-Track Crawler for Tractors

Standard-Gage Unit Broadens Service of Light-Weight Tractor

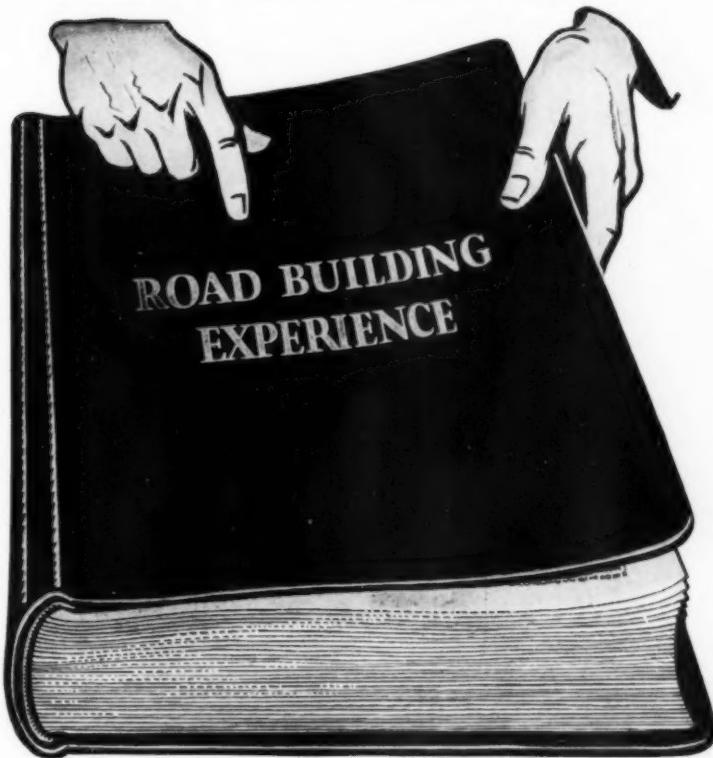
A STANDARD-GAGE or wide-track crawler, which is a companion to the Belle City narrow-gage crawler, has recently been announced by the Belle City Manufacturing Co., Racine, Wis. This wide-track crawler is developed particularly for contractors and highway builders, for logging, lumbering, sand and gravel pit use,

and for various other needs where ordinary traction is desired but where special equipment, such as loaders, backfillers, hoists, cranes, etc., is to be attached. The new standard gage model, like the narrow gage, is clutch-controlled, has full Timken roller-bearing equipment, Alemite-Zerk oiling system, drop-forged treads and saw-steel clutch discs running in oil.

The standard-gage has the same measurement between treads as that between the regular Fordson drive wheels. It uses any standard-drive pulley and accommodates any industrial equipment used on the wheel-equipped tractor without any special attachments. The additional width of this model is obtained by substituting for the regular Fordson axle housing, internally ribbed steel housings, of the same contour and with the grooves used for attaching equipment, exactly the same distance apart as in the regular housing. To provide a front end or third point of suspension for the tractor, a heavy cast steel saddle or walking beam is pivoted on a shaft passing through the Fordson front axle stirrup, and to this walking-beam is bolted on either side heavily leaved springs whose outer ends are connected to the main frame assembly by means of steel shackles.



THE BELLE CITY TRACTION FOR HEAVY EQUIPMENT



At your disposal—

A vast fund of road-building experience has been gathered by The Barrett Company during the past twenty years.

At your request the Tarvia field man will be glad to put this fund of information at your disposal. No obligation, of course.



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Cincinnati
Birmingham
Bethlehem

Boston
Kansas City
Louisville
Columbus
Rochester

When heavy equipment is attached to the crawler, requiring a connection to or the support of the front axle, then the springs are replaced by heavy steel members attached in the same manner as the springs. The steel axle is equipped with rubber bumpers, which act as shock absorbers.

Ample additional strength and rigidity are given

to the main frame assemblies, according to the manufacturer, by the use of a 1½-inch special steel radius rod or spacer which connects these two assemblies passing under the tractor crankcase.

The manufacturer claims that when these crawlers are attached to a Fordson delivering its rated drawbar horsepower, it will equal any 2-ton crawler.

A New 6-Ton Tractor

Designed Especially to Give More Power in the Medium-Duty Field

IN every territory there is a growing demand for more power. Road officials and contractors have demanded a tractor of moderate size which can successfully handle a 10-foot grader or equivalent loads under extreme conditions. The engineers of the Monarch Tractors Corporation, Springfield Ill., have developed a new 6-ton Model-H tractor particularly to meet these requirements.

In contracting, the 6-ton provides the power and speed for hauling wagons from an elevated grader or from a shovel, and for use with bulldozer it provides more strength and convenience with compact construction, rapid reverse and a design which readily permits attachment of a bulldozer of the hydraulic or other types.

The speeds of this new model are, first, 1.86;



THE
NEW MONARCH
6-TON TRACTOR
IN ACTION

This tread-mounted tractor is capable of pulling a 10-foot grader under extreme conditions or an 8-foot or 9-foot grader digging deeper cuts or operating at faster speeds. The manufacturers also state that in maintenance work its extra power and extra speed are decided advantages. It will pull maintainers, scarifiers and other road tools which overtax the capacity of lighter-weight tractors.

second, 2.82; third, 4.07; and reverse, 3.26 miles per hour. By installing larger transmission sprockets, the above speeds can be increased to 2.04, 3.01, 4.47, and 3.58, respectively. The tractor develops 40 horsepower at the drawbar. Its general dimensions are 9 feet 9 inches long over-all, 6 feet 1 inch wide over-all, 5 feet 2 inches high to the top of the radiator, 7 feet 2 inches high with top, and 7-foot ground contact.

Welded Steel Buildings Predicted

ALARGE building in which electric welding instead of the usual riveting, will soon be erected, according to an announcement made by Gerard Swope, President, General Electric Company, in his talk before the New York Building Congress on the subject "Electric Power in the Construction of Buildings."

Mr. Swope says, "It is difficult to picture the changes that have come about in large building operations by the greater use of electric power. Not so many years ago brick and mortar were taken to the different floors on the backs of human beings, and now the picturesque hod-carrier has disappeared and his place has been taken by electric motors.

"Electric power, as a matter of fact, has been

one of the important factors which has made possible the construction and erection of these tall buildings, as well, indeed, as their operation, and the work that is done by electric motors in erection is almost inconceivable. An appreciation of it, however, can be had when the statement is made that in the erection of one of the large buildings in New York, the total hoisting work was 64,000,000 foot-tons, which means raising 64,000,000 tons one foot or raising 640,000 tons 100 feet.

"The daily operation of tall buildings would be impossible if it were not for the electric motors used in connection with the elevators, which have been developed for sure and rapid service.

"In the building industry, as well as in industry in general, where earnings of labor have risen so rapidly, the use of electric power has been an

100 H. P. Waukesha Equipped Clyde Hoist at Cazadero, Ore.



n-712-M

Flexible as Steam

This is one of the compliments Waukesha equipped hoists get from every operator who has used them. They are light in weight for their power, thus making it possible to skid them about under their own power. Here is one shown chunking out a new road with a drag line outfit.

They go where no steam rig could go because they use little water and an easily portable fuel, gasoline. The engines will operate at angles up to 60 degrees due to special provision made for this service. They are made in complete Industrial Power Units varying from 20 to 125 H. P. Write for latest bulletins No's. 540 and 581.

N-717-M

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important factor in keeping costs down to such a point as will make a fair return on the investment in these large structural steel buildings possible.

"One of the latest developments of the electrical industry in connection with the erection of buildings, is electric welding of the steel structures. This still is in the developmental stage, but some buildings have already been erected using electric welding, and others are projected. The advantages of electric welding are a reduction in steel sizes, because provision in strength does not

have to be made in considering holes for rivets, a reduction in cost of handling, because engineering layouts showing detail of rivets will be unnecessary and structural steel can be shipped directly from the mill to the structure that is to be erected, a further reduction in the cost of assembly, and, in addition, an advantage of inestimable value in the almost total elimination of the noise which is now attendant on the riveting of steel structures. The General Electric Company has plans for the erection of a large building using electric welding."

Force-Feed Lubricators for Heavy Construction Equipment

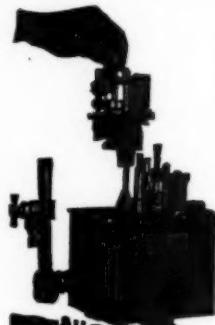
Units Are Accessible and Interchangeable for Inspection and Adjustment

FORCE-FEED lubricators are a necessity in well-built, heavy-duty construction equipment.

Such companies as Thew, Erie, Marion, Bucyrus, Russell, Osgood, Browning, American Hoist & Derrick, and others, use McCord force-feed lubricators, made by the McCord Radiator and Manufacturing Co., Detroit, Mich., as standard equipment on steam shovels, cranes, hoisting apparatus and backfillers.

McCord lubricators are automatic, all friction surfaces being supplied continually with oil in just the right place and quantity. This flow of oil is regulated automatically by the starting and stopping of the machine. The amount of oil can be regulated from one drop to a full stream per minute. Every drop of oil is made to do full duty, resulting in a saving of at least 50 per cent in the cost of the lubricant, according to the manufacturer.

The pump units of the McCord force-feed lubricators are interchangeable and may be removed for inspection or cleaning with the aid of a screwdriver and without affecting the operation or adjustment of any other unit. These lubricators are made of drop-forged steel, case-hardened, with all operating parts working in a bath of oil. Numerous



MC CORD LUBRICA-TOR, SHOWING
ACCESSIBILITY

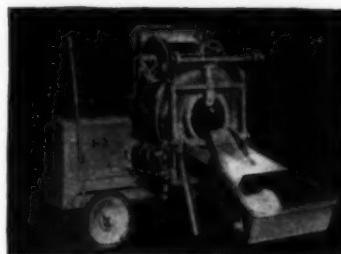
inspections in the course of manufacture, followed by a final inspection and test against 2,000 pounds pressure, insure each lubricator's being ready for service when taken from the box. The lubricators are shipped carefully packed and ready for installation.

A. R. E. A. Adopts Water-Cement Ratio in Specifications

THE American Railway Engineering Association officially adopted a specification for proportioning concrete on the basis of water-cement ratio, at its recent annual convention in Chicago. This specification was prepared and presented for adoption by the Association's Masonry Committee, of which C. C. Westfall, Bridge Engineer, Illinois Central Railroad, is Chairman, and Job Tuthill, Assistant Chief Engineer, Pere Marquette Railway, is Vice-Chairman. The adoption of this specification by the A. R. E. A. marks the abandonment of the 1:2:4 and other arbitrary mixes which have been in use for many years. Instead, the ratio of water to cement is specified and the proportions of sand and stone are largely left to the discretion of the individual engineer. According to this law, the strength of concrete, with-

in the limits of plastic workable mixes, is inversely proportional to the amount of water used. By applying this law, engineers can secure concrete of a specified strength within given limits. This specification by its adoption will become recommended standard practice for all railroads in the United States and Canada and will appear in the next issue of the Association's Manual of Recommended Practice.

A new specification for portland cement was also accepted. The specification was recently adopted by the American Society for Testing Materials and was prepared by Committee C-1 of that Society. C. C. Westfall, J. J. Yates and M. Hirschthal, who are members of this committee, also belong to the Masonry Committee of the American Railway Engineering Association.



Send Back This

Here's the Speedster of 5-S Mixers!

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Load it from the ground level! No need for spending time and money building loading platforms, or elevated runways!

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Specifications: 5-S. Nickel steel worm drive transmission in oil bath; Ricardo head, Universal single cylinder, 4 cycle motor, radiator cooled. Power charging skip — low charging hopper and platform. Rubber tired steel disc wheels or steel rimmed wheels.

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A New Scale for Architects, Surveyors and Builders

Aimed to Increase Speed and Accuracy of Drawings and Measurements

ALTHOUGH professional construction surveying is only in its infancy in this country, yet it has already brought about the development of a new scale as a result of the efficient methods used by the surveyor in the measurement of drawings. This new scale greatly increases the speed and accuracy of the architect's drawings, the surveyor's measurements and the builder's interpretations of the drawings in process of erecting a structure of any type, steel, frame, or reinforced concrete.

in the same way, but have $\frac{1}{8}$ -inch divisions, each representing one foot, with one-inch subdivisions. The numerals representing feet on this side of the scale are indicated at alternate foot marks on the scale.

This description also applies to scales of any other gradations. One lineal inch or more is divided into equal parts each part representing one foot, and it is then subdivided into twelve equal parts with each subdivision representing one inch of the one-foot division.



NEW TYPE OF ARCHITECT'S, SURVEYOR'S, AND BUILDER'S SCALE

The new scale, made by the Universal Engineering Co., Bridgeport, Conn., consists of four beveled edges with two scales on one side and two on the other, each reading from left to right on opposite edges, making the scale readable without turning it end for end. Two scales on one side are divided into quarter inches, each representing one foot, and each foot subdivided into twelve equal parts to represent inches. Numerals are indicated at each foot represented on the scale. The two scales on the reverse side are constructed

These chain scales can be made in any reasonable length, although it has been found from practical experience that 6-, 12- and 18-inch lengths are most convenient to use, depending of course on the size of sections to be measured. The 12-inch scale, indicating 48 feet on two bevels, with $\frac{1}{4}$ -inch representing one foot, and 96 feet on the other two bevels, with $\frac{1}{8}$ -inch representing one foot, has been found to be the most efficient and practical length scale for general use by the construction surveyor.

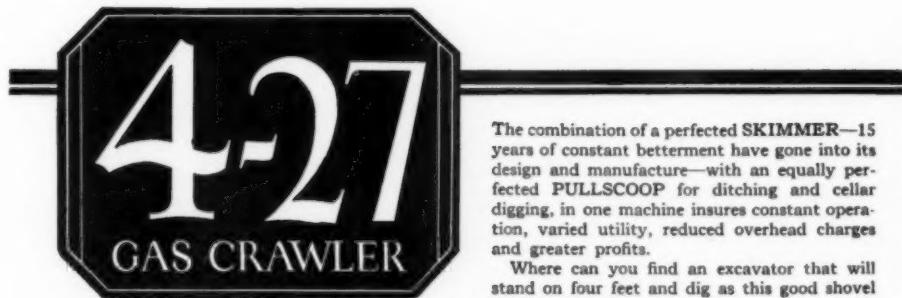
Something New in a 10-S Building Mixer

Machine Designed to Take a Full Two-Bag Batch of a 1:2:5 Mix

A MACHINE that is something entirely new in the mixer line, has been announced by its designers, the Chain Belt Co., Milwaukee, Wis. Several departures from the usual engineering features found in this type of machine have been made. The new 10-S mixer will take a full two-bag batch on a 1:2:5 mix. The machine has no countershaft. The engine clutches, drum drive hoist and power take-off have been in-

corporated in one unit assembly. This has been accomplished with case-enclosed cut-tooth gears that are constantly running in oil and take power directly from the engine. An automotive-type 10-horsepower four-cylinder gasoline engine completes the unit and is responsible for eliminating considerable unnecessary vibration.

For a quick, even flow of water a new type of valve, known as the Free Way valve has been



The combination of a perfected SKIMMER—15 years of constant betterment have gone into its design and manufacture—with an equally perfected PULLSCOOP for ditching and cellar digging, in one machine insures constant operation, varied utility, reduced overhead charges and greater profits.

Where can you find an excavator that will stand on four feet and dig as this good shovel does?

May we tell you more?

1927 FEATURES

The Electric Trip has a kick like the shot of a gun. It is almost as quick and just as positive—



The 4-27 SKIMMER has a new three-piece body, so that the side plates can be replaced when worn or damaged without renewing the entire body of the scoop. The rear hanger is made of one steel casting—a stronger construction—free from the possibility of spreading.

a joy to the operator because he can by touching the switch on his hand lever drop the bucket load exactly when and where he pleases. Other new features are the Steel Cab; the Crawler-lock; Timken Roller Bearings on the improved Skimmer and on the machine proper; and Relay Chain Drive to the Crawlers. Catalogue and more information will go at your request.



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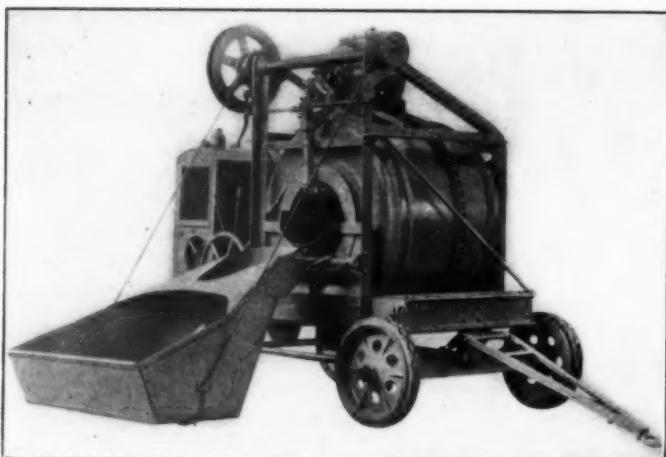
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THE
NEW REX
10-S
BUILDING MIXER
WITH LEROI
ENGINE

selected. Practically no dribble is possible when shutting off the water with this new type of valve, according to the manufacturers. Greater handling and towing ease has been made possible by a new front axle construction on 4-inch I-beams. The wheels are mounted in automotive fashion in such a manner that they can be turned in a shorter radius.

Another interesting feature of this machine is the spring mounting on the rear axle. The entire mixer is mounted on three-point suspension and both rear wheels are spring-mounted to take up

the unusual shocks. Alemite lubrication is used throughout. By an extensive use of malleable castings and pressed-steel rollers, this machine has been reduced in weight, according to reports, to about a half-ton less than other mixers of this size. Pressed-steel drum rollers, free floating on bronze bushings, have replaced castings. Other castings where great strength and long life are required have been changed from cast iron to certified malleable iron, the tensile strength of which is 30,000 pounds greater per square inch than cast iron.

Torches Built to Protect Construction Work

Inexpensive Torches of Drawn Steel with Counterbalance to Prevent Upsets

CONSTRUCTION torches which are inexpensive and furnish sufficient light to warn users of highways against trenches or other excavations along the way have been developed by the McCloskey Torch Company, 3343 Collingwood Avenue, Toledo, Ohio. These torches are made of $\frac{3}{8}$ -inch rolled and pickled deep-drawn steel and have $5\frac{1}{2}$ pounds of cast iron counterbalance pressed in the bottom, preventing the torch from being knocked over. The torch holds three quarts

of oil and is furnished with wick all ready to fill with kerosene and light. These torches will burn from Saturday night until Monday morning with just one filling and they do away with the need of dangerous barricading. The manufacturers state that the torches remain lighted during the hardest wind and rain storms and are easily carried by a special handle. Thieves do not care for these torches as they are suitable for construction work only.

Steel Molds for Round Concrete Columns

STEEL molds for concrete columns are less liable to expand than molds of other materials. They hold the concrete to its form while setting. This leaves a surface which, when the molds are removed, is ready to receive either paint or kalsomine as desired with but little touching up on the surface of the columns. The architectural effect of round concrete columns is superior to any other form of column and in point of economy effects a saving of $21\frac{1}{2}$ per cent in concrete alone. The round concrete column occupies less space and obstructs less light than a column of any other form and the surface, being smooth, reflects a greater proportion of light.

Another advantage of the round concrete col-

umn, according to Des Lauriers Metal Products Company, Inc., Detroit, Mich., manufacturers of Des Lauriers steel concrete column forms, is that there are no corners to be bruised and broken during construction or when the building is occupied. Des Lauriers molds, while especially serviceable for any flat slab construction, are so made as to be equally applicable for columns without capitals in connection with beam and girder construction. These forms, the use of which is shown in the accompanying illustration, are very flexible as regards erection, require little framing and absolutely no bracing. Their use results in smooth, hard, true columns requiring a minimum amount of finishing.

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A GUIDE to selecting the most efficient conveyor for the particular requirement.

HUNDREDS of illustrations tell thousand word stories at a glance. Handling everything from Coal to Bananas.

SEVEN standard types—More than Fifty Sizes—Numerous permanent and semi-permanent installations.

YOU will find many things of interest and profit to you in this complete Catalog—Cheerfully sent on Request.

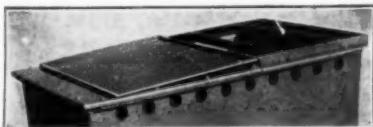
Ask for Catalog 273

Portable Machinery Company
Lakeview Ave., Clifton, N.J.

Improvements in Oil-Burning Melting Kettle

New Windshield, Front Splash-Guard, and Cover Added

SEVERAL new features have been announced by Littleford Bros., 485 East Pearl Street, Cincinnati, Ohio, in the Type 84-W Littleford oil-burning tar and asphalt melting kettle. These features, shown in the accompanying illus-



NEW DESIGN OF COVER



WINDSHIELD TO PROTECT OIL BURNER

trations consist of a removable windshield to protect the burner, a new design of cover, and a front splash-guard.

The windshield is made of steel plate and completely surrounds the flame of the torch, eliminating all possibility of the wind interfering with the operation of the burner. The cover is made in two sections, as heretofore. However, one section is bolted down and the other is hinged to it. This construction makes it impossible for the cover to be jolted out of position. The hinged section lays on top of the stationary section when open. Under the hinged section of the cover is a grid on which barrels may be placed for drain-

age. This grid is removable.

The front splash-guard is located at the top of the melting tank and consists of a steel plate extending three inches horizontally inside of the tank and then flanging down for three-quarters of an inch. This guard prevents the contents from spilling out the front end of the tank when the kettle is trailed. At the rear end of the tank the bolted-down section of the cover accomplishes the same result. This Littleford oil-burning melting kettle is made in three capacities—50, 75 and 110 gallons.



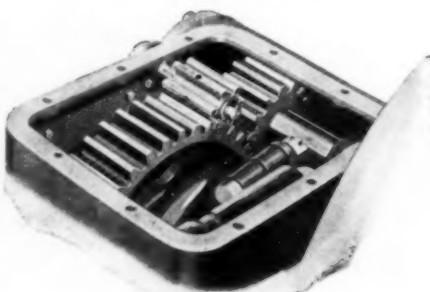
IMPROVED LITTLEFORD MELTING KETTLE 84-W

A New Oiling System for 1- 2- and 3-Cylinder Piston Pumps

Means Provided for Automatically Flooding Every Moving Part with Oil

A NEW enclosed self-oiling system for one-, two- and three-cylinder piston pumps has been announced by the Novo Engine Co., Lansing, Mich. The new Flud Oild feature is said to be automatic, simple, and fool-proof. In pumps built with this lubricating system, the pump crank-shaft gear runs in oil and, revolving, brings oil to the Flud Oild gear at the top. This small gear, the only moving part of the lubricating system, through an ingenious arrangement of oil ducts in its teeth, discharges oil with great force to both sides of the crankcase. Deep grooves feed the oil to the crosshead, pin, and to all bearings. The connecting rod, in addition to dipping in the oil, receives a torrent of oil from the small gear above at the top of each stroke.

The single- and double-cylinder enclosed piston pumps with this feature are double-acting inside-



PUMP CRANKCASE OF NOVO FLUD OILD SINGLE-CYLINDER PUMP
The small oiling gear with oil ducts in teeth is plainly shown

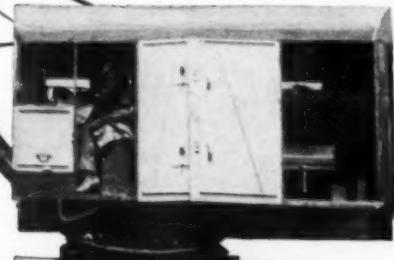
For Tough jobs.

The 2 SPEED

The Ideal $\frac{1}{2}$ Yard Utility Machine

 The Speeder Shovel-Crane is designed and built for years of the hardest kind of service. It's ready for tough jobs with reserve power—provided by the exclusive *two speed* feature on both traction and drums.

Light weight—slightly less than 15 tons, full circle swing, positive cable crowd—*independent* of hoist, and easy convertibility, give the Speeder high operating efficiency, economy of operation and ease of transportation.



SPEEDER CONVERTIBILITY

With no changes back of the boom hinges, the Speeder is quickly and easily converted to

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- SKIMMER
- PULL SHOVEL
- CRANE
- MAGNET
- DRAG LINE

Write for new catalog of Speeder excavating and material handling machines.



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Gas and Electric Material Handling Machines

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packed pumps powered with Novo one- and two-cylinder gasoline engines or electric motors. The Triplex pumps are built particularly for road builders operating a 28-E paver. The pump has a ca-

pacity of 70 to 85 gallons per minute at 400 to 500 pounds pressure. It is powered with a 25- or 35-horsepower, 4-cylinder engine and is mounted on a steel truck.

A Trailer Plaster-Mixer

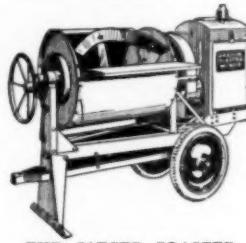
Model Made with Narrow Axles for Inside Mixing

A TRAILER plaster-mixer of the self-cleaning hoe type is made by the Jaeger Machine Co., Columbus, Ohio. The trailer model type which is a one-sack size will take care of 15 to 25 plasterers. It is a well-known fact that machine mixing of plaster cuts mixing costs in half, and increases the output in mortar or plaster, which spreads faster and more easily under the trowel.

The Jaeger narrow-tread mixer will go through an ordinary 33-inch door and can be raised in a material cage. There are two sets of axles furnished on the trailer mixer. The regular axles on the two- or four-wheel mixers are 47 inches long, but a set of axles which are only 31½ inches long can be substituted on the two-wheel outfit for use where the mixer is to be taken into a building for mixing in cold weather.

These mixers are also made mounted on road trucks with disc wheels and cushion tires, as well

as being made in combination with a hoist and mounted on steel wheels so that the same machine equipped with an 8-horsepower 2-cylinder LeRoi engine can mix the plaster and hoist it to the place desired.



THE JAEGER PLASTER MIXER

A Sturdy Industrial Locomotive with Hoist Attachment

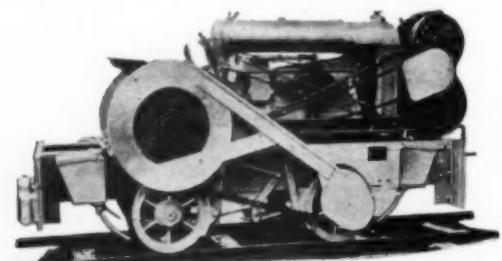
Manufacturers Combine to Increase Effectiveness of Fordson-Powered Unit

A USEFUL piece of equipment for contractors using industrial haulage on construction jobs has been developed through the cooperation of the Brookville Locomotive Company, Brookville, Pa., with manufacturers of Fordson hoists. Thus, the well-known Brookville Ford-

son-tractor-driven industrial locomotive is now available with Ersted and Allison hoists attached. In this way the locomotive not only can handle its hauling as run along the track but is capable of operating as a hoist when needed.

The Brookville locomotive is built in all gages from 23 to 56½ inches and has three speeds forward and three reverse. These are, in the first series, forward or reverse, low 1.125 miles, intermediate 2.07 miles, and high 4.063 miles per hour. In the second series, forward or reverse, low 1.875 miles, intermediate 3.45 miles, and high 8.437 miles per hour. A change from one of these speed combinations to the other can be made in approximately one hour's time by merely changing sprockets on the jack shaft from 25 tooth to 15 tooth.

The accompanying illustration shows an Ersted hoist made by the Ersted Machine Manufacturing Company, Portland, Ore.



BROOKVILLE LOCOMOTIVE EQUIPPED WITH ERSTED HOIST

Prizes for Papers on Arc Welding

The American Society of Mechanical Engineers, 29 West 39th Street, New York, has accepted the custody of \$17,500 given by the Lincoln Electric Co., Cleveland, Ohio, to be awarded for the three best papers on arc welding under rules stated in a booklet which may be secured from the American Society of Mechanical Engineers. The award for the first paper is \$10,000, for the next best \$5,000, and for the third best \$2,500.

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is now
equipped
with —

IN the new Parsons 30, you get the advantage of these vital improvements, backed by the same power, the same capacity, the same ruggedness that has earned the Parsons 30 its reputation for digging more dirt per dollar. Get a closer look at the improved Parsons 30. Bulletin 3027 gives details you'll want to know.

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TRENCH EXCAVATING EQUIPMENT

1. Non-Stop Power Shift Conveyor

Shifts by power even when the machine is digging. Enables you to do faster work in close quarters. The conveyor is of the arc-type, which has already proved remarkably successful on other Parsons machines. The shift is controlled through self-locking worm and worm-gear.

2. Simplified Boom Hoist and Crowder

The boom-hoist and crowder has been simplified so that the coil springs, which protect the boom when it strikes an obstruction in digging, are now an integral part of the chain that controls the raising and lowering of the boom. This eliminates several parts, and strengthens the entire construction.

3. Four-Speed Transmission

Truck-type Fuller transmission, operated by a twin-disc clutch, gives four digging speeds at a shift of the gear lever. (Twenty additional speeds obtained by sprocket changes.) The four-speed range enables the operator to take full advantage of favorable soil conditions.

A New and Successful Method of Curing Concrete

Bituminous Compound Effects an Internal Cure

AN entirely new system known as the Hunt process has been developed by the Everlasting Paint and Sales Co., 704 Sun Finance Building, Los Angeles, Calif., for the treatment of newly laid concrete paving surfaces to promote an internal cure to prevent hair cracks, and to give the surface a better color from the standpoint of the driver. The treatment consists of spraying a liquid coating of McEverlast protective coating on the surface with a spray gun, or brushing it on in cold form in the same manner as paint is applied. The base materials of this coating are Trinidad Lake asphalt and Utah Gilsonite, the greater part

drying out. It is stated that concrete paved streets on which this coating was used have been opened for traffic within eight days, without damage to the coating or concrete.

Recently comparative tests were made within a short distance on a certain street, one section having been cured by the moist earth method and the other by the Hunt process. It is stated that after a period of eight months, under actual traffic conditions, the concrete cured by the Hunt process still showed the original float marks and no checking or cracks had developed. In addition, the coating was still effective



APPLYING
McEVERLAST
PROTECTIVE COAT-
ING TO
NEWLY LAID
CONCRETE PAVE-
MENT

of the material being Trinidad Lake asphalt. These base materials blended with other materials in lesser quantities, and produced under certain processes, give the liquid coating.

The method of application is as follows: Within thirty minutes to one hour after the concrete mixer has completed its work, a coating of McEverlast is applied on the surface. After this nothing more is done, and as a rule the street or highway is opened to traffic after the usual fourteen-day curing period. It is claimed that this gives an even cure which protects the pavement and is particularly valuable in extremely hot or windy weather as it prevents

as a "kill glare" and contrasted favorably with concrete cured by the dirt and water method, which had begun to dust off and show contraction cracks.

It is claimed that there is a peculiar quality in the product used that gives it an affinity for concrete whether wet or dry. It has been shown that if this product is applied, by means of a paint gun, on a concrete pavement in which some spots are still moist, the material will settle over the wet surface, forming a film and coating the entire pavement. With the soaking of the water into the concrete, the film adheres to the concrete, forming an air-proof coating.

Two Methods of Determining

THE U. S. Bureau of Standards has just completed an investigation comparing the Brinell and Rockwell methods of determining the hardness of a great number of ferrous and non-ferrous metals and alloys. Convenient, semi-experimental formulas have been derived by means of which the Rockwell or the Brinell hardness number can be computed from the other number with an error of less than 10 per cent. Similar formulas were obtained also for tensile strength which can be computed from the Rockwell number within an error of 15 per cent.

The importance of this work will be realized when

Hardness of Metals Compared

it is remembered that the safety of buildings, bridges and machines of every kind depends upon the correct use of structural materials. The designer strives to be economical in the use of materials, so as to avoid excessive weight and needless expense, yet each part must be sufficiently strong for any load which it may have to bear.

In order to find the strength of any metal or alloy, a portion of it is worked into a convenient shape and tested in a testing machine. In most cases, the designer is interested in the tensile strength of the material. A tensile test is, however, expensive, and often no sufficient number of specimens to repre-



and

SIMPLICITY OF INSTALLATION

Newport "Gohi" Culverts are the easiest culverts to install. They are light in weight and can be handled conveniently, even by unskilled workmen, without a tripod or power arrangement. Manufactured complete before the shipment is made. No joints to be calked and leaded. All sizes, round and half-round types, in multiples of two feet.

"CORRUGATED FOR STRENGTH; GALVANIZED FOR LONG-LIFE"

Made of Iron Copper Alloy (99.875% Pure), these culverts are the most rust-resisting on the market . . . guaranteed to last longer, under identical conditions, than any other corrugated culvert pipe. Newport Culverts have endured the tests of time and the elements. They will not *crack or break!* Let our Engineering Department help solve your drainage problem. Write to us today! No obligation.



sent adequately the whole part can be obtained. Fortunately, a substitute for the tensile test which is satisfactory for a great many practical purposes exists in the so-called indentation hardness test. It is inexpensive, can be made in a few minutes, does not require an expensive preparation of the specimen and can often be made on a finished part without destroying it.

This test consists in making an indentation in the part which is tested by a hard indenting tool loaded with a constant load. It is evident that the harder the material, the smaller will be the indentation. Therefore, the size of the indentation is the measure of the indentation hardness. The indentation hardness number which expresses a certain relation between the constant load and the variable

size of indentation may be used to calculate with a sufficient degree of accuracy the tensile strength of various materials of similar nature from different sources.

Two of the most often used indentation tests in this country are the Brinell and the Rockwell tests. In order to be able to compare the hardness or tensile strength of two materials for one of which the Brinell and the other of which the Rockwell number is known, it is necessary to know the relationship between these numbers. This relationship has been worked out in the present investigation, which is reported in Technologic Paper No. 334 obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents each.

Sturdy Equipment on Grade-Elimination Project



ONE OF THE FLEET OF TWENTY 5-TON DUMP-TRUCKS OPERATED BY THE HERKNER MOTOR TRUCKING COMPANY, CLEVELAND, OHIO

These trucks are taking the place of the usual railway dump-wagons in hauling away rock and dirt on the huge grade elimination project on six main-line tracks of the Pennsylvania, Erie and Baltimore and Ohio Systems, at Akron, Ohio. A Marion Type-7 steam shovel is handling the excavation. Two tracks are removed at a time, and the excavation is completed and the rails replaced before work is started on the next two. No traffic is routed over the four undisturbed tracks, but it is impossible to use railway dump-cars because they would obstruct regular passenger and freight service. The cut, which is about 4,000 feet long and 12 feet deep at its greatest depth, will mean the removal of 200,000 cubic yards of earth including 15,000 to 20,000 yards of rock.

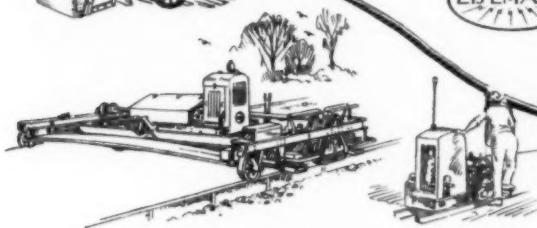
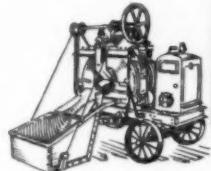
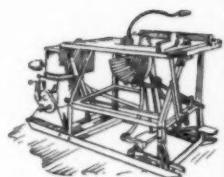
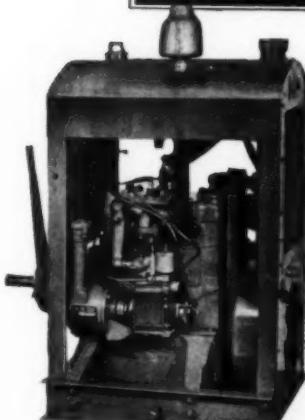
New Climax Distributors

THE Climax Engineering Co., Clinton, Iowa, has announced the appointment of the Hunter Machinery Co., Milwaukee, Wis., as distributor for Climax Engines and power units. The Hunter Machinery Co. will maintain a supply of parts for Climax engines in Wisconsin and will also handle Climax engines in western Michigan, selling this territory through Grand Rapids.

Announcement is also made of the appointment of the Belknap Hardware and Manufacturing Co., Louisville, Ky., as distributor for Kentucky, northern Tennessee, West Virginia and portions of Virginia and North Carolina. Woodward-Wight & Co., New Orleans, La., are dealers in Climax engines for southern Louisiana and southern Mississippi.

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A hundred-odd makers of equipment now use Le Roi power, and the list of users is still growing.

Such widespread use must be indicative of user-satisfaction. And the trouble-free ignition system, with which all Le Roi Engines are equipped, accounts—in a measure—for this user-satisfaction.

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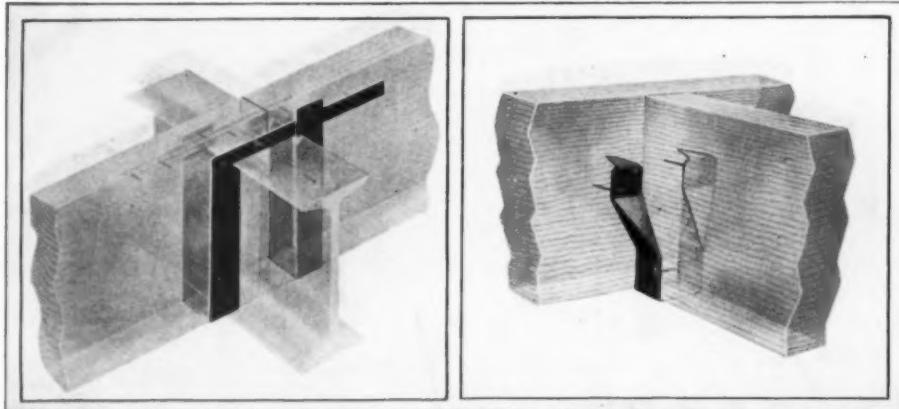
New Devices for Building Stronger Wood Floors

Hanger for Hanging Joists on Wood Framing and Hanger for Hanging Wood Joists on I-Beams

HERE is a general movement throughout the United States to improve the quality of building construction, especially as applied to residences or apartments. It has been found that many small items which have been overlooked or neglected in the past are very important in many ways to good construction. In many cases steel I-beams are used for supporting wood joists in houses and apartments. These joists have been connected in the past by means of wood strips bolted to the I-beams, upon which the joists have been toenailed,

joint. These hangers, made by the Blaw-Knox Co., Pittsburgh, Pa., also eliminated the trouble heretofore caused by shrinkage, especially where a wood shelf was used, which meant double shrinkage and splitting of the joist where it was notched at the I-beams. With these new hangers in stock, the contractor does not need to wait for I-beams to be drilled or punched or for shelf angles to be installed, but can simply order I-beams to be cut to the necessary lengths.

A quick, economical joist hanger has also been



METHODS OF OVERCOMING BEAM TROUBLES. AT LEFT, NEW BLAW-KNOX SYSTEM FOR ATTACHING WOODEN FLOOR-BEAMS TO STEEL I-BEAMS. AT RIGHT, NEW METHOD OF ATTACHING STRINGERS TO BEAMS AROUND OPENINGS IN HOUSE CONSTRUCTION

or by riveting steel shelf angles to the I-beams for the same purpose.

Contractors have long desired a satisfactory method of connecting the joists securely together across the I-beams, thus making the joist practically continuous. This has now been accomplished by the invention of a new steel hanger, called a Quixset hanger, which not only supports the joist on the I-beam, without any connection to the I-beam, but also ties the joists securely together across the I-beam, making it practically one continuous

designed and is now being furnished to building contractors. It is known as the Junior joist hanger. This hanger can be used for all sizes of joists and has two sharp steel prongs at the end of the hanger which are driven into the side of the header and securely support the joist in any desired position. These hangers are quickly and easily applied and after their installation the contractor and owner can rest assured that settlement at this point has been eliminated and that the floor will be just as rigid at openings as elsewhere.

A One-Man-Operated Backfiller

Attachment for Light Tractor Lessens Cost of Filling Trenches

NEW one-man-operated backfiller, consisting of an auxiliary boom and bucket for the standard Baker-Fordson, has been announced by the Baker Steel & Machinery Co., Omaha, Nebr., and is known as the Baker "Kicker." The Kicker boom and bucket reverses the usual action of the backfiller, pushing the dirt into the ditch from the

same side on which the machine is located instead of pulling it from the opposite side in the usual manner. The loaded bucket or scraper is pulled toward the end of the boom away from the machine itself instead of toward the machine.

It is especially handy for backfilling ditches that are laid near the curb where the spoil bank is

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3/4-Ton Chassis F. O. B. Detroit

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They Are Good
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THE
BAKER KICKER
BACKFILLING A
TRENCH

thrown toward the center of the street, occupying the space usually occupied by the backfiller. The boom may be set at any desired vertical or horizontal angle by means of the boom winch.

The Kicker boom and bucket are quickly interchangeable with the standard boom and bucket, not more than fifteen minutes being required for the

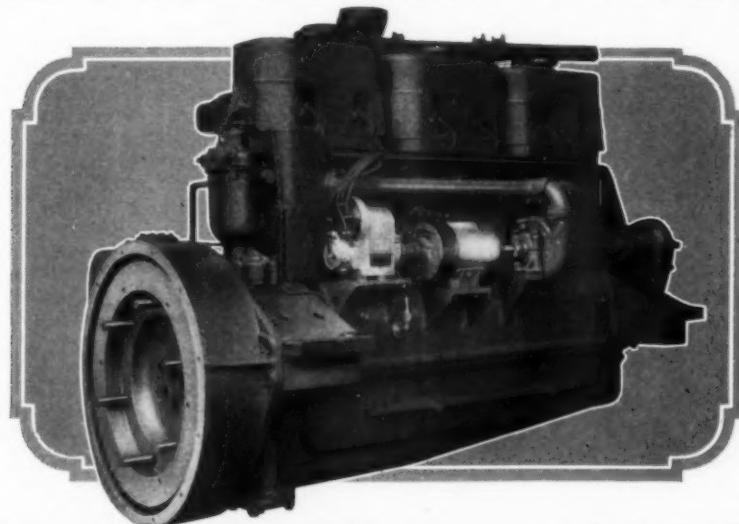
change. It is constructed of two channels, 16 feet long, on which runs a roller carriage with a scraper, 48 inches long, attached. Like the standard Baker backfiller the Kicker is operated entirely by one man, and according to the manufacturer will backfill from 1,000 to 1,500 feet of 2 x 6-foot ditch per day.

Preparing the Foundations of Another Large New York Office Building



TYPE-O THEW SHOVEL BEING USED BY GEO. J. ATWELL COMPANY, NEW YORK, IN HANDLING THE EXCAVATION FOR THE NEW NO. TWO PARK AVENUE BUILDING, A 26-STORY OFFICE STRUCTURE ON THE SITE OF THE OLD PARK AVENUE HOTEL

You should have seen this shovel the other day turning a right-angle in moving from one part of the job to another, at the same time dodging a big bonfire built by the laborers to keep themselves warm during the noon hour when the temperature was about 25 degrees. It made the turn so nicely that one of the spectators commented, "It takes the corners as easy as a Ford."

FOR DEPENDABLE POWER!

Low as 3-High as 160 H.P.

**ENGINE
BUILDERS
only!**

Doing one thing only—and doing it well—that's why Le Roi can furnish so wide a range of power. From the small engine on tilting mixers to the "Brute Beaver" that gives action to rock-gouging shovels—Le Roi's the power. And it's the most dependable and economical.

LE ROI COMPANY
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LE ROI ENGINES
NOW RANGE FROM 3 TO 160 HORSE-POWER

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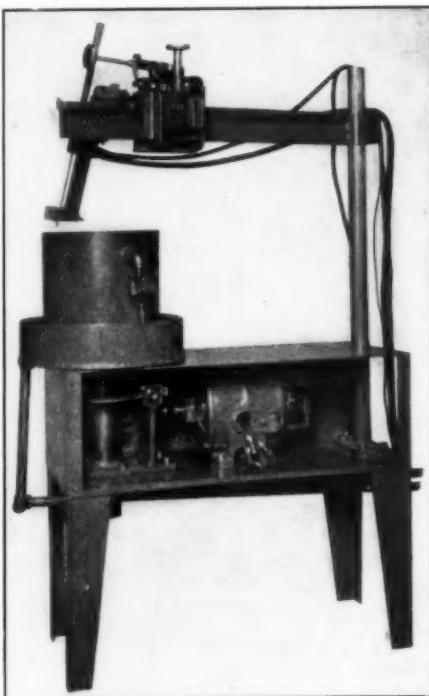
New Electric Welder Works Under Water

Field of Usefulness of Electric Arc Welding Materially Extended

THE rapid acceptance of electric arc welding has induced manufacturers of this type of equipment to bring out many new and interesting welding machines. The accompanying illustration shows a new carbon arc welding machine built by the Lincoln Electric Co., Cleveland, Ohio, which is an example of one of the latest developments in this field. The automatic carbon arc welding machine has been found capable of welding pieces in which no preparation of the edges to be welded, is made. The machine shown will weld circular seams up to 12 inches in diameter. A particular feature of the machine is the cooling tub around the revolving table which carries the piece being welded. The piece on which the welding is being done may be partially or totally immersed in water during the welding operation. Cooling water is in circulation in the tub during operation.

The novel cooling arrangement used on this equipment was developed to meet the requirements when welding high-grade alloy steel, on which the heat disturbance due to application of welding heat must be reduced to a minimum. In the case of 12 per cent manganese steel, the welding may be done with the piece totally immersed in water and the arc submerged. This cooling arrangement is well adapted to the welding of manganese steel since the rapid quenching of the molten metal gives it the physical properties expected in 12 per cent manganese steel.

The frame and details of the machine are all made of welded steel construction and the machine itself is a good example of the increased use of welded steel construction.



THE NEW LINCOLN ARC WELDER WITH WATER BATH

A New Joint-Pouring Machine

Fifty Feet of Joint in Concrete Road Poured Per Minute

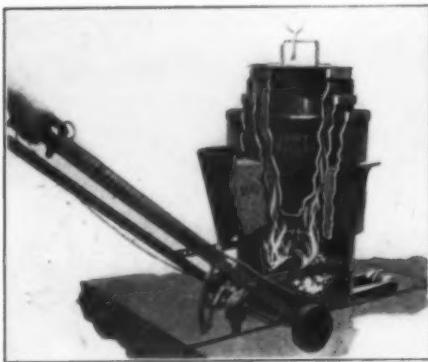
A NEW joint-pouring machine which is so constructed that the fire is between the joint filler compartment and the sand compartment, has recently been developed by the Heltzel

Steel Form & Iron Co., Warren, Ohio, to heat, pour and sand joints in concrete pavements.

The filler discharge pipe passes through the fire box, which maintains a uniform heat, thus depositing the filler at a uniform temperature. The flow in the discharge nozzle is regulated by a needle valve. Inasmuch as the filler is heated at the time of pouring, it penetrates to the bottom of the joint. The manufacturers claim 90 per cent heating efficiency in this joint-pouring machine.

The flow of the sand and filler is controlled by hand-operated rods which are adjustable as to height. No bridging is necessary as the broad tread wheels do not mar the concrete. A pilot wheel rides in the joint, insuring alignment.

The sand compartment is recommended for use on grades to prevent the filler from flowing out, but is not necessary on semi-level roads. A fire box is provided for any kind of fuel or the machine is equipped with an oil burner when desired. This machine may be used for pouring both longitudinal and transverse joints.

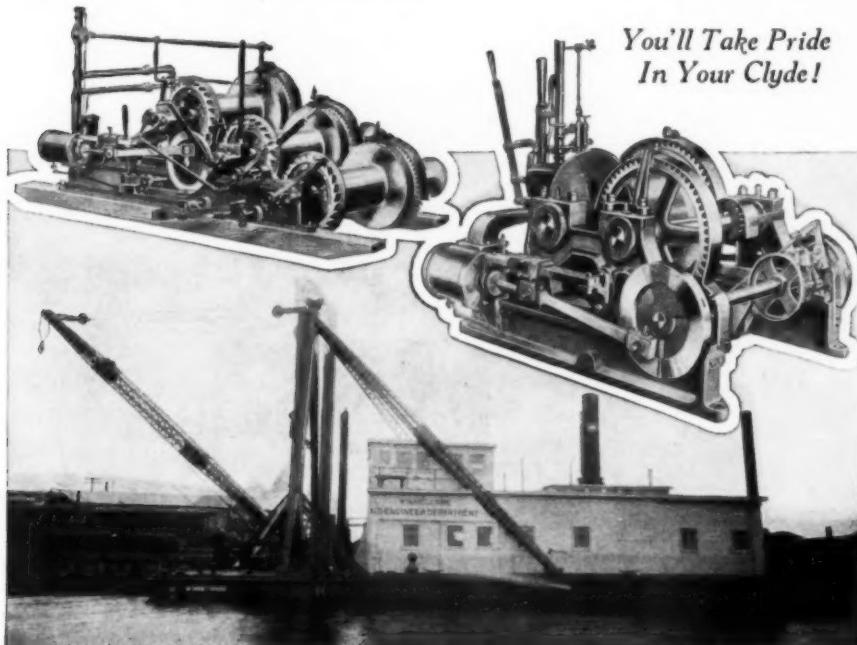


THE NEW HELTZEL JOINT-POURING MACHINE

HOISTS CLYDE DERRICKS

Photograph shows Barge Winneconne operated by the U. S. Engineer office at Milwaukee which is used for harbor dredging. It was built by the Leathem D. Smith Dock Co., Sturgeon Bay, Wis., with all hoisting machinery supplied by Clyde.

The equipment consists of a three-drum hoist which handles the Clyde 15-ton clam shell derrick, a swinging engine handling the derrick boom and three special spud hoists for handling two spuds in front and one in the rear. Information about this type of equipment supplied on request.



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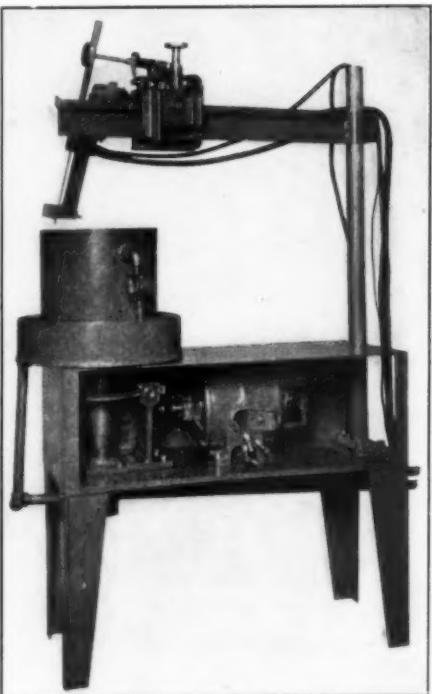
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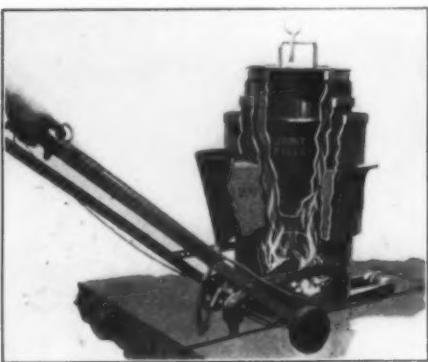
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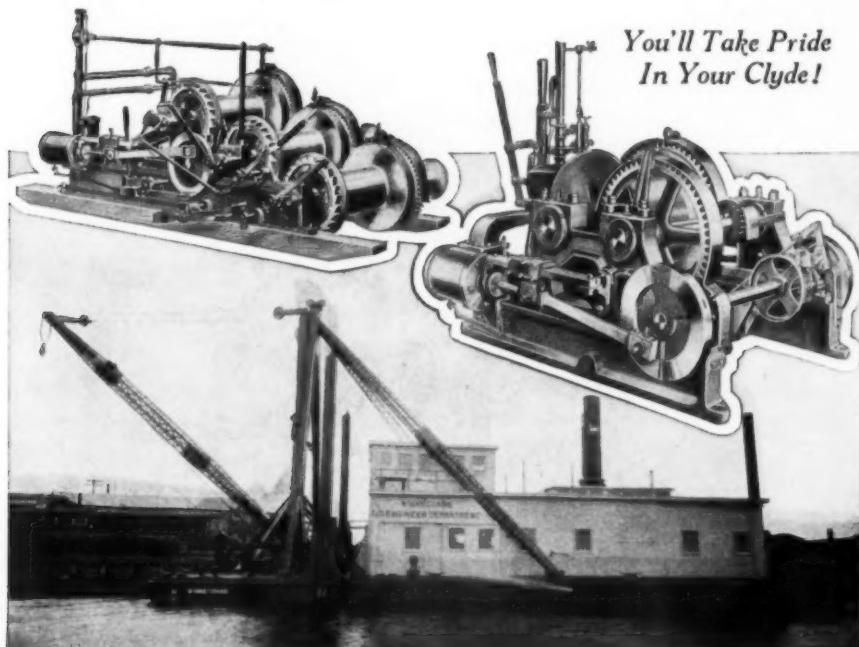


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New Development in Tractor Governor

Now Available for McCormick-Deering 15-30 Tractor

THE Pickering Governor Co., Portland, Conn., has announced that the Pickering governor has now been developed for the 15-30 McCormick-Deering tractor. Heretofore, the Pickering was adapted only to the 10-20 model having a round flange. The latest model is provided with a special spacer casting to act as a mounting piece for the governor, enclosing its driving gears.

The governor is furnished as a complete unit and is easily and quickly interchanged with the original tractor equipment. Like all Pickering governors, the new model is equipped with a built-in speed changer, a device for increasing or decreasing the speed while the motor is running.

This new development was brought about by the demand from owners of McCormick-Deering tractors for a Pickering governor adapted especially for this make of tractor.



PICKERING GOVERNOR ON 15-30 McCORMICK-DEERING TRACTOR

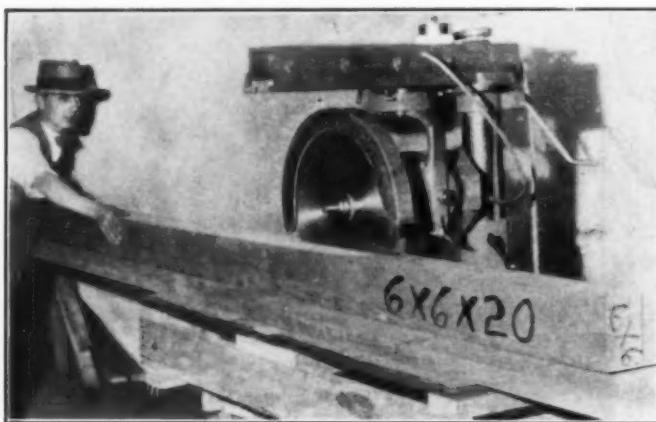
An Electric Woodworking Machine

Unit Is Portable and Easily Carried by Two Men

A N electric woodworking machine that is claimed to do all kinds of woodworking jobs six times faster than they can be done by hand, has been announced by the DeWalt Products Co., Leola, Pa. It is said that any builder can easily save one hundred dollars per house with this machine in operation. It cuts thirty studs in eight

of general contractors.

The machine is compact, sturdy and portable and can be easily carried by two men. The cross-arm swings in a complete circle and the motor raises and lowers and tilts to any angle. The tools are mounted direct to the motor drive and can be changed in about a half minute. The motors are



NEW
WOODWORKER
WITH SWINGING
HEAD

minutes, 2 x 10 joists in four seconds, and can make 25 bridges while one is being cut by hand. It saves the time lost by measuring and marking, as a guide is set and then piece after piece may be cut in duplicate. A jack-rafter cut can be made with one motion and a complete stair of fourteen risers can be routed in twelve minutes. These are a few of the advantages claimed for the machine in the service

equipped with aluminum casings to prevent rust. The yoke carrying the motor moves back and forth on a slide block on a covered track, which is protected from rust. The motor is said to be as flexible as a man's wrist, but when locked in position stays rigidly in that spot. This machine is made in sizes from $\frac{1}{2}$ to 5 horsepower for light- to heavy-duty service.



Climax R6U—the Engine used in this Crawling-Tread Machine



**List Below Shows
Leading Manufacturers
Using Climax as
Standard Equipment**

Austin Machine Co., Muskegon, Mich.
Bay City Dredge Wks., Bay City, Mich.
Brown & Root Machinery Co.,
Cleveland, Ohio
Gruening Crane Co., Cleveland, Ohio
Harrington Crane Co., Chicago, Ill.
Davenport Loco. Wks., Davenport, Iowa
The Felt-Roet-Heath Co., Plymouth, O.
Four Wheel Tractor Co., Big Rapids,
Mich.
Galloway Wks. & Mfg. Co., Galloway, O.
Great Divide Coal Co., Pittsburgh, Pa.
Industrial Works, Bay City, Mich.
J. T. Fricker Co., Cleveland, Ohio
K. C. Fricker Co., Pittsburgh, Pa.
Lidgerwood Mfg. Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.
McMeyer-Interstate Co., Cleveland, O.
Mid-West Loco. Works, Cincinnati, O.
Milwaukee Gear & Machine Mfg. Co.,
Milwaukee, Wis.
Minnesota Manufacturing Co., Ferry, Minn.
Northern Pump Co., Minneapolis, Minn.
Orts Crane & Shovel Co., Chicago, Ill.
The Palmer Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wandtcheer Bros. Mfg. Co.,
Geo. D. Whitecomb Co., Rochelle, Ill.
Wisconsin Farm Tractor Co.,
Madison, Wis.

The Crane illustrated is said to be the largest Crawling-tread Crane used exclusively for locomotive crane purposes. It was manufactured by the Orton Crane & Shovel Company of Chicago for the Great Lakes Portland Cement Company.

This equipment consists of two electrically-operated gantry cranes, each equipped with 65-foot booms and 4-cubic-yard clamshell buckets and one 30-ton crawling-tread gasoline-operated locomotive crane equipped with 70-foot boom and 2½-yard clamshell bucket.

**Powered
with**

CLIMAX

Manufactured by

CLIMAX ENGINEERING COMPANY, Clinton, Iowa

Eastern Branch: 30 E. 42nd St., New York, N. Y.

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Chicago Branch: 2007 Harris Trust Bldg., Chicago, Ill.

Los Angeles, Calif.: Coast Machinery Corp.,

464-66 E. 3rd St.

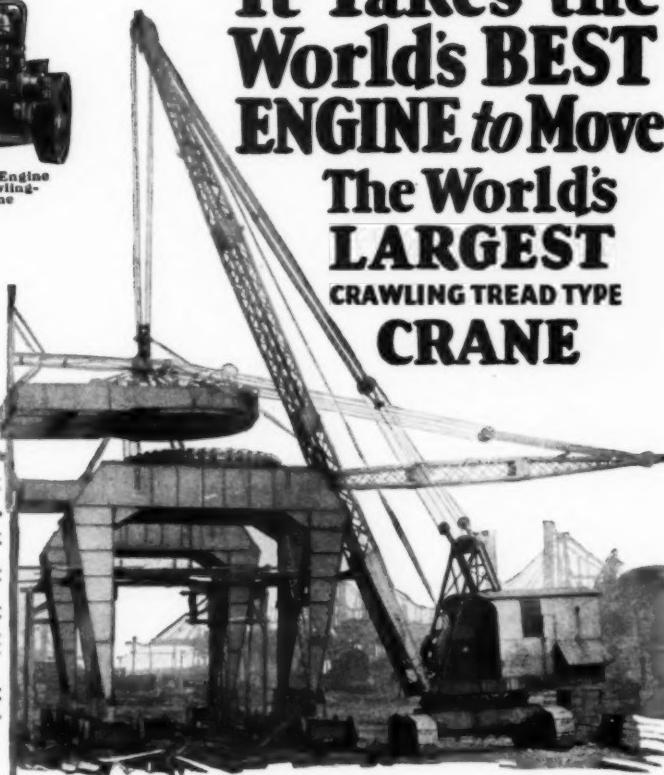
The gantry cranes will be used for unloading boats and stocking material, each machine having a capacity of 350 tons per hour. The crawling-tread crane is used for erecting the plant and later for reclaiming stone and loading cars. A unique feature of the installation is the use of the crawling-tread crane in setting up the large gantry cranes.

The total weight of the Crane is 135,000 pounds. The crawling-tread machine is equipped with 6-Cylinder, 140 H. P. *Climax* Engine.

**The "Trustworthy"
ENGINE**

San Francisco, Calif.: Coast Machinery Corp.,
829 Folsom St.
Portland, Ore.: J. L. Lattice Equip. Co.,
354 Belmont St.
Montreal, Que., Can.: Edward C. Dingman,
1005 Keefer Bldg.

It Takes the World's BEST ENGINE to Move The World's LARGEST CRAWLING TREAD TYPE CRANE



Mechanical Hoist with High-Lift Feature for Dump-Trucks

Combination Makes Possible Wide Variety of Services for Contractors' Trucks

THE well-known mechanical hoist made by the Wood Hydraulic Hoist & Body Co., Inc., 7938 Riopelle Street, Detroit, Mich., is built in two sizes, one for the lighter trucks of 1½, 2½, and possibly 3 tons capacities, and a heavier hoist for trucks up to and including 7-ton models. This hoist was originally designed and marketed only for simple rear end dumping.

The principal feature of the Wood mechanical hoist when used for straight end dumping is its extremely high dumping-angle of 70 degrees. This high angle assures quick and clean discharge of practically any bulk material which is handled in a dump-body. The hoist consists of a gear transmission case with all gears enclosed and operating in oil. The hoist is completely controlled from the driver's seat by a single lever. A two-direction power take-off furnishes power for raising and positive lowering. The body stops automatically at the fully raised and fully lowered positions, and can be held at any point desired and raised or lowered while the truck is in motion. A complete hoist consists of the transmission gear assembly, lifting rack, body and truck hinges, two-direction power take-off, driving shaft and universal joint, control lever and control rod, making a complete hoist outfit ready for attaching to the truck chassis.

The Hi-Lift unit, while used principally by coal dealers, has many applications in contracting ser-



WOOD MECHANICAL HOIST ON INTERNATIONAL TRUCK, SHOWING HIGH DUMPING ANGLE

vice where it is helpful to have the truck body raised considerably above the ground for dumping. A feature of the Hi-Lift unit is that when the body is in the down position, a slight pull on one of the shifter handles disengages the pin holding the auxiliary lifting arms. The hoist will then elevate the body as an ordinary end-dumping body. The change from end dumping to high lifting can be made just as easily by reversing the procedure. The lifting mechanism is built of structural steel with 5-inch I-beam lifting and 5-inch channel auxiliary members for the 3-ton unit and 6-inch I-beams and 6-inch channels for the 6-ton unit.

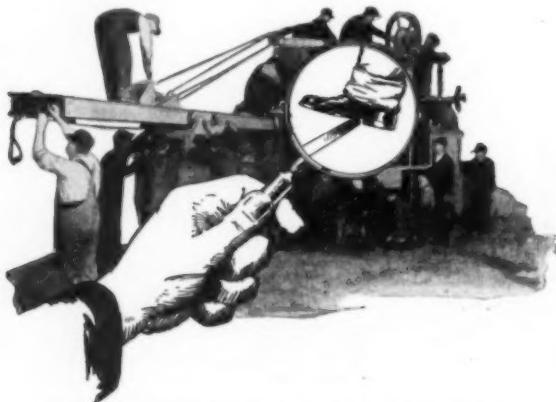
Centralized Lubrication for Pavers

27-E 6-Bag Paver the First to Have Latest Lubrication Device

INSTANT central lubrication from the operator's platform has recently been installed as standard equipment on the 27-E 6-bag paver made by

the T. L. Smith Co., Milwaukee, Wis. This makes it possible for the operator, by simply pressing a lever with his toe, to force lubrication simultaneously to the bearing surfaces in the machine. Such a system is decidedly new in pavers and will undoubtedly be welcomed by paving contractors throughout the field.

One man is now able to do the work of thirty in a fraction of the time, and the ease with which this central system is operated not only insures perfect and consistent lubrication, but encourages frequent attention on the part of the operator. The manufacturers feel that the installation of the system on the Smith 27-E will bring about even smoother action and greater dependability in this machine.



CENTRAL LUBRICATION ON SMITH 27-E PAVER

Directory of
Distributors
See pages 175-208



THE roadway shown in the above photograph is
Wheelock Parkway, St. Paul, Minnesota.

This pavement was laid early in 1924, of asphaltic concrete, standard construction. The asphalt used was

Stanolind Paving Asphalt

The photograph was taken early in 1927. It shows that the pavement, after three years of heavy service, is entirely free from holes, cracks and other defects, and is practically as good now as it was the day it was laid. For longer road life under all kinds of conditions, use Stanolind Paving Asphalt.

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A Gas-Electric Industrial Locomotive

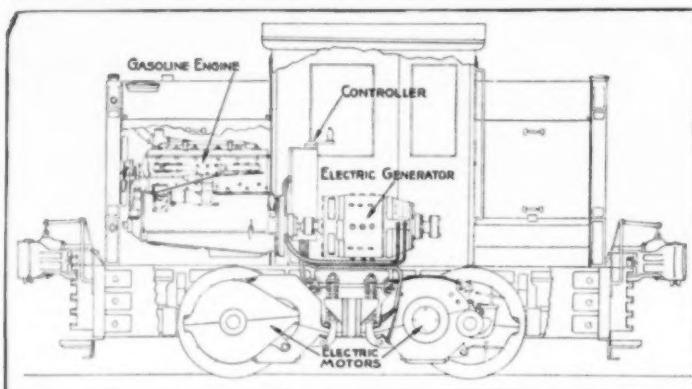
New Unit for Contracting Service

THE flexibility and reliability of the gas-electric locomotive in the railroad field have been taken into consideration by the Davenport Locomotive Works, Davenport, Iowa, and has led to the construction of 8-, 10-, 16-, 20-, and 24-ton gas-electric locomotives for industrial switching, brick yards, contractors, quarries, etc.

The locomotive is simple in design, consisting of a gasoline engine, an electric generator, a controller,

motive has a capacity of from 200 to 400 100-watt lamps.

The gasoline engines of standard makes are equipped with an electric starter, air cleaner, adjusting carburetor, and governor. With this type of gas-electric unit it is impossible to stall the engine by sudden overloading and the full capacity is always available. The electric power equipment is manufactured by the General Electric Company and



DIAGRAMMATIC
ILLUSTRATION OF
NEW DAVENPORT
GASOLINE-
ELECTRIC
LOCOMOTIVE FOR
INDUSTRIAL
SERVICE

and a motor for each axle, making all wheels drivers. The operator requires one hand for control, one hand for the brakes and one foot for use on the accelerator. In addition to its great value as an easily operated powerful industrial locomotive, it can be used as a portable electric power-plant when operating electric drills, hoists or windlasses, and it can serve a construction camp, supplying electricity for cooking and lighting. The loco-

consists of the generator, controller, and standard heavy-duty motors, oversize in capacity and of proved practical design. Any speed up to 35 miles an hour can be secured without any gear shifting.

According to the manufacturer, a unit of this type costs less to operate than a gasoline-driven or steam-driven unit, the upkeep is less, more ton-miles per day are possible, and there is no fuel expense, except when the locomotive is in operation.

An Excavator for General Service

May Be Equipped with 1/2-Yard Bucket or Used as Crane or Trencher

A N excavator designed to serve as a shovel, crane, dragline, ditcher, skimmer or backfiller, and for operation with a gasoline engine or electric motor, is manufactured by the General Excavator Co., Marion, Ohio. The General excavator is full revolving and is mounted upon continuous treads.

The gasoline engine used on the power-plant is a heavy-duty 4-cylinder Buda of 4½-inch bore and 6-inch stroke. It runs at a speed of 1,000 r.p.m., delivering 45 horsepower. The oiling system of the power-plant is of the force-feed type, oil under pressure being forced to all bearings. The main drive between the power-plant and operating machinery is through a silent chain, protecting the engine from shock and delivering the full power of the engine to the machinery with a minimum of friction losses.

The main clutch between the engine and operat-

ing machinery is located at the end of the counter-shaft and is not a part of the engine. The clutch



A GENERAL EXCAVATOR EQUIPPED FOR POWER-SHOVEL SERVICE

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IT has long been a standard practice to use couplings of the Dresser type for high pressure lines. For water or natural gas lines this joint may be equipped with regular rubber gaskets. For lines conveying manufactured gas, lead tipped gaskets are generally specified.

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is heavy and of an approved standard make. It operates at slow speed and is at the instant command of the operator through the lever at his right hand.

The drums are double and independent on the same shaft. They are used for seven different operating combinations. They have deep grooves for guiding the wire ropes and are provided with wedge sockets for anchoring these ropes. When the machine is used as a shovel, the drums control the hoisting and crowding motion; when it is used as a crane, the drums insure accurate control of the clamshell bucket; when converted to a dragline, ditcher, trencher, skimmer, or backfiller, etc., no additional operating machinery is required. These drums are bronze-bushed for their entire length.

The clutches for digging, hoisting, swinging and traveling are four in number. They are of the outside contracting band type and are lined with standard asbestos fabric lining, the same size lining being used on all clutches and brake bands. The clutches are actuated by the "Easytouch" control - a simple mechanism consisting of a loose wheel mounted on the drum shaft and connected through simple linkage to the main clutch band with a check band encircling the wheel. Tightening the check band retards the wheel momentarily and through the linkage tightens the main clutch band. To set the clutch requires only a short movement of the control lever. When the lever is returned to normal or neutral position, a spring automatically releases the main clutch without any effort on the part of the

operator.

The controls, consisting of levers and pedals controlling every operation of the machine, are centralized and within easy reach of the operator from his seat. Four levers and two pedals are used for all ordinary operations. Two of these levers control the reversing clutches, the third handles the pull-back drum clutch and the fourth handles the hoisting drum clutch. The pedals, which have broad corrugated pads and self-locking latches, control the hoisting drum brake and pull-back drum brake. The use of a separate lever for each of the reversing clutches avoids the dragging of the clutches and prevents heating and extreme lever throw. Since both clutches can be used at once, it is often convenient to use one as a swinging brake. One of these two levers is pulled to engage its clutch, while the other is pushed. The other levers for throwing the swing and travel gears in and out, controlling the boom hoist, steering the machine and disconnecting the engine from the machinery, are all convenient to the operator, whose position is at the extreme front of the machine, where he has an uninterrupted view of his work.

The machine is moved by means of a cast steel spur gear with cut teeth loose-mounted on the vertical travel shaft. A heavy jaw clutch throws this gear into action. Steering is accomplished by disconnecting the power from either one of the tread belts. It is said to be possible to turn the machine quickly in very small space, or to make it describe a wide circle, as desired.

New Grease Cups for Pressure Lubrication

Many Features of Novel Product Make It Desirable for Varied Uses

A NEW "Hex-Top" malleable iron compression grease cup with Alemite or Zerk fittings has been put on the market by the Link-Belt Company, 910 South Michigan Avenue, Chicago, Ill. This combination of grease cup and fitting is a distinct improvement over either article used separately, in that the "Hex-Top" has the advantages of both the grease cup and the fitting, which are applied so universally in industrial lubrication.

The trade name "Hex-Top" describes very aptly the shape of the grease cup head. Six-sided, it offers an easy purchase for any type of wrench, and a good grip for the hand.

One of the many uses to which the new product is admirably fitted is in the lubricating system of a long belt-conveyor using many grease cups for the idlers. Here, the easiest, quickest, and most economical way to fill all the cups at one time, according to the manufacturers, is with a grease gun applied to the Alemite fitting when the cap is turned up to the high point, but not entirely unscrewed or removed. The filling can be done without waste of grease and without inconvenience; the cup holds a good reserve for use of the compression feature, and an occasional slight screwing down by hand or wrench is all that is necessary until it is time to have a general refilling of the cups. If the bearing gets warm when the grease

gun is not at hand, a turn or so of the cap takes care of the emergency.



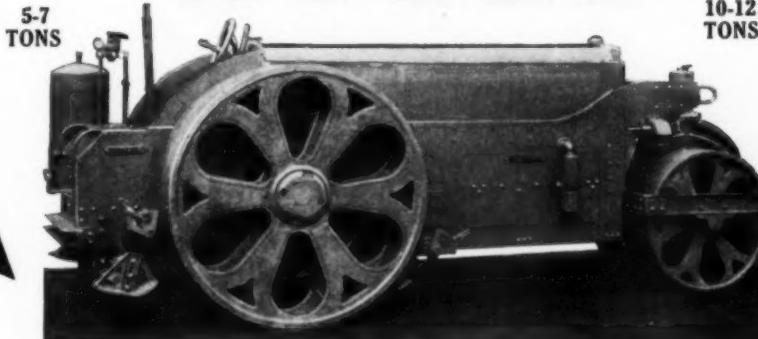
HEX-TOP GREASE CUP FOR ALEMITE LUBRICATION

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If you have earth to move, regardless of the job, you should investigate these three items, and learn first hand just how they can be adapted to your work. How easily it is to move more earth and at a far lower cost than you have thought possible.

The attached coupon will bring you complete details and our Liberal Trial Offer.

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Use It

THE catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

SPECIAL BALL-BEARING ELECTRIC DRILL

Black & Decker Mfg. Co., Towson, Md., will be pleased to send complete information and prices covering its new $\frac{3}{4}$ -inch special ball-bearing electric drill complete with spade handle and breastplate, three-jaw geared chuck for straight shank drills, duplex electric cable, etc. This drill is particularly serviceable for contractors, electricians and for general shop work.

A PORTABLE LINK SAWING MACHINE

The Wolf portable link sawing machine made by Reed-Prentiss Corp., Worcester, Mass., which is particularly adaptable to cutting heavy timbers and logs and can be used for mitering accurately up to 45 degrees, is completely described in literature which may be secured from the manufacturer.

A NEW GASOLINE ROLLER FOR CONTRACTORS

The Erie Machine Shops, P. W. Dietly, Prop., Erie, Pa., manufacturers of standard steam rollers, have announced two sizes of tandem gasoline road rollers which have already proved their value and have met the requirements of exacting contractors.

ONE-MAN POWER-SCRAPERS

"What a Whale of a Difference 2 Wheels Make!" is the title of a new booklet issued by the Miami Trailer Scraper Co., 610 S. Clay St., Troy, Ohio, describing the Miami one-man power-scraper which performs difficult jobs of dumping over embankments, loading trucks from platforms, dumping with tractor in reverse and carrying the load over uneven ground, as well as moving large yardage on straight ahead earth-moving work.

A MORTAR BOX THAT CAN'T BREAK OPEN

Steel mortar boxes which can't break open at the ends, as they are made from a single sheet with sides folded and lapped around the ends, are water-tight, cannot sag or bend because of the heavy steel reinforcing angles around the top, have wide handles for easy carrying, and are made in three standard sizes, are manufactured by the Akron Barrow Co., 3140 E. 65th St., Cleveland, Ohio, and described in their literature.

STEEL NEVER FAILS

This is the title of an informative illustrated fact-book issued by the American Institute of Steel Construction, Inc., 285 Madison Ave., New York, telling facts about structural steel and why it is the strongest, safest, most flexible and most durable of all building materials. Send for your copy.

REDUCING THE COST OF PUMPING

The American Steam Pump Co., Battle Creek, Mich., will be pleased to send to interested contractors a copy of its Bulletin 56 telling how the Barton portable pump reduces the cost of pumping on any job where drainage must be accomplished by mechanical means quickly and at little expense.

MIXERS OF STURDY DEPENDABLE CONSTRUCTION

Information and prices regarding Atlas mixers, which will produce from 120 to 150 cubic yards of concrete in ten hours with a one-bag mixer and which are also made in $3\frac{1}{2}$ -foot, $\frac{1}{2}$ -bag and 2-bag sizes, may be secured from the Atlas Engineering Co., 3036 Galena St., Milwaukee, Wis.

MAKE WATER RUN UP HILL

The complete descriptive bulletin of the Domestic Engine & Pump Co., Shippensburg, Pa., covering their full line of force pump units, including the Giant triple road pump which has dirt-proof and oil-retaining pump and gear housings, as well as oil supplied under pressure direct to every bearing, will be sent on request.

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Information and prices regarding Iroquois asphalt mixing plants, made in portable, stationary, electric or steam-driven types and in sizes of from 400 to 2,000 square yards, as well as full details regarding the Iroquois line of driers, rollers, paving tools, and all equipment for street paving and road building, will be sent upon request by the Barber Asphalt Co., Iroquois Sales Dept., Philadelphia, Pa.

COLD PATCHING FOR ROADS

Road contractors who are contemplating repair work on any types of roads should secure copies of the booklet "Helpful Hints for the Foreman of the Repair Gang," issued by the Barrett Co., 40 Rector St., New York.

ALL-STEEL SCRAPERS

The Beach Manufacturing Co., Charlotte, Mich., will be pleased to send information and prices on Beach all-steel, self-loading scrapers which will outwear a dozen board scrapers.

HAND PLASTER MIXERS

Blystone mixers, which use 30 to 40 per cent more sand than when plaster is mixed by hand, will mix plaster for twenty-five plasterers, will go through a door 30 inches wide, and have plenty of power, built-in clutch die cast bearings, and steel or hard-rubber tire wheels, are described in the literature of the Blystone Manufacturing Co., 327-C Street, Cambridge Springs, Pa.

OIL-BURNING TOOL AND SURFACE HEATERS

Chausse oil-burning tool and surface heaters, as well as kerosene torches and portable asphalt plants, are manufactured by the Chausse Oil Burner Co., 1227 W. Beardsley Ave., Elkhart, Ind., from whom complete information and prices may be secured without obligation.

PORTABLE CONVEYORS

The Chicago Automatic Conveyor Co., 998 Old Colony Bldg., Chicago, Ill., manufacturers of Chicago automatic portable conveyors with non-clogging receiving ends for every conveying purpose in the contracting field, will be glad to send information and prices on request.

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Hand bush hammers made in sizes for every bushing and dressing job on concrete, as well as the complete line of pneumatic tools and chisel equipment for bushing concrete and finishing cast stone, hand points and chisels, hand and striking hammers, drill bits and hollow steels, are described in the literature of the Dallett Co., Philadelphia, Pa.

A LUBRICANT FOR HEAVY-DUTY MACHINERY

Information regarding D-A lubricant, a densified Pennsylvania oil, especially adapted for use on heavy-duty machinery, displacing cup greases and gear compounds, may be secured on request from the D-A Lubricant Co., Inc., Indianapolis, Ind.

DERRICKS AND WINCHES

Catalog No. 22 describing Dobbie derricks and winches as well as a complete line of fittings manufactured by the Dobbie Foundry & Machine Co., Niagara Falls, N. Y., may be secured by contractors on request.

STRONG FORMS FOR ROAD BUILDERS

The Heltzel catalog describing Heltzel steel road forms, which are claimed to be 20 per cent stronger than other rails because of the reinforcing flanges, and in which there are no bolt or rivet holes to weaken their construction, will be sent on request by the Heltzel Steel Form & Iron Co., Warren, Ohio.

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Full information describing the new improved Lata surface heater, which is operated with a gasoline engine, designed for power at low speed, thus doubling its capacity, simplifying its operation and saving time and labor, may be secured from the Equitable Asphalt Maintenance Co., Kansas City, Mo.

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The Everhot Manufacturing Co., Maywood, Ill., will be pleased to send to interested truck and automobile owners complete details and prices regarding the Everhot tire-branding outfit, which will stop losses through the stealing of tires from their equipment.

TRUCKS WITH POWER, SPEED AND STAMINA**AT LOW COST**

Information and prices on Graham Brothers trucks, which have ample power and on which the operating and maintenance costs are low, may be secured by interested contractors by writing to Graham Brothers, Detroit, Mich.

STEEL HOISTS AND DUMP-BODIES

The catalog of the Heil Co., 1243 26th Ave., Milwaukee, Wis., describing this company's complete line of steel dump-bodies, hoists and tanks for motor trucks, as well as the Heil Hydro twin-cylinder hoist, which is guaranteed to operate satisfactorily for a period of two years, may be secured without obligation by interested contractors.

CLAMPS THAT SPEED UP WORK

Wire clamps for wall, beam or column forms, splicing clamps, targets which simplify the leveling of concrete slabs, column clamps, M & M shores which are placed, locked, adjusted or released with a hammer, and M & M screed gages which can be removed and used over and over again, are manufactured by the M. & M. Form Clamp Co., 2 Fifth St., S. E., Minneapolis, Minn., who will be glad to send samples, literature and prices on request.

REINFORCED EXPANSION JOINTS

W. R. Meadows, Inc., Elgin, Ill., will be pleased to send information and prices on Sealight reinforced joints in which the long flexible vegetable fibre filler permits the asphalt to ooze sufficiently to seal the joint perfectly, but prevents it from running out of the top.

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Information and prices on Nelson Fordson loaders, either wheel-mounted or crawler-mounted, with a capacity of 100 cubic yards an hour for stock-piles, hatching or grading, will be sent free on request by the N. P. Nelson Iron Works, Inc., Allwood, Passaic, N. J.

REINFORCED CONCRETE PIPE

Sketches showing the type of joint furnished with the precast reinforced concrete sewer pipe made by the Newark Concrete Pipe Co., 462 Broad St., Newark, N. J., as well as information on the pipe itself, will be sent to interested contractors and engineers.

CORRUGATED OPEN-HEARTH IRON CULVERTS

A valuable corrugated culvert handbook "C" describing the use of Newport Gohl culverts made of 99.875 per cent pure iron-copper alloy in all sizes in multiples of 2 feet and easily installed by unskilled workmen, may be secured from the Newport Culvert Co., Newport, Ky.

DEERICKS, SHEAVES AND BLOCKS

The Universal Hoisting Machinery Corp., 420 Seymour St., Buffalo, N. Y., will be pleased to send information and prices to contractors interested in their full line of derricks of either steel or wood, wire rope sheaves and blocks, and hand or electric winches.

CEMENT-LINED CAST IRON PIPE

Full information regarding cement-lined deLavaud cast iron pipe in which the cement lining, which is extremely dense and has a porcelain-like surface, adheres to the iron so tenaciously that the pipe can be cut or tapped without breaking the coating adjacent to the cut, may be secured from the U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.

FLOODS AND LIQUID CHLORINE

The prevention of water-borne diseases by water sterilization through chlorination, while always important, is absolutely vital in times of floods. For complete information on this subject, write to Wallace & Tiernan Co., Inc., Newark, N. J., manufacturers of chlorine control apparatus.

RELIABLE ENGINES FOR CONTRACTORS'**EQUIPMENT**

The Waukesha Motor Co., Industrial Equipment Div., Waukesha, Wis., will be pleased to send a copy of its book "Industrial Applications" describing Waukesha "Ricardo head" engines in sizes from 20 to 120 horsepower and how they are used in thirty-two different kinds of industry.

LIGHT DELIVERY TRUCKS

The White Co., Cleveland, Ohio, has announced a reduction in the prices of two models of four-speed light delivery trucks. Full information regarding Models 15 and 20 with inbuilt quality, ruggedness and exclusive White mechanical features may be secured without obligation from this company.

A NEW BOOKLET ON EXCAVATING

A new booklet, "Excavating for Profit," which shows in detailed pictures and diagrams how Sauerman slack-line cableways dig, convey and elevate and are operated by one man, and tells how many users are cutting the cost of excavating and gravel producing, will be sent free to interested contractors by Sauerman Bros., Inc., 464 S. Clinton St., Chicago, Ill.

CURING CONCRETE ROADS

The Solvay Sales Corp., 40 Rector St., New York, will gladly send a copy of its Booklet No. 2051 "Curing Concrete Roads with Solvay Calcium Chloride" to contractors. This booklet contains complete specifications for all concrete curing, by both surface and integral methods.

AUTOMATIC DUMP-BODY FOR FORD TRUCK

The model 6620 Superior automatic dump-body for Ford one-ton trucks with 1 1/2-cubic-yard water-level capacity, 52-inch loading height and 19-inch ground clearance, is built by the Superior Body Corp., Marion, Ind., from whom complete information and prices may be secured.

REINFORCING FOR CONCRETE ROADS AND PAVEMENTS

A handbook, "Modern Road Construction and Field Book," in a new and catalogued edition, has recently been issued by the Truscon Steel Co., Youngstown, Ohio, manufacturers of welded steel fabric reinforcing, contraction joints, rib bars, curb bars and steel road forms. A copy will be sent free on request.

WATER-METERS, VALVES AND FIRE WHISTLES

Catalog G-57 issued by the Union Water Meter Co., Worcester, Mass., describes this company's complete line of water-meters, valves, stops, pipe lining equipment and fire whistles.

TRAILERS FOR ALL PURPOSES

Trailers for shovels, cranes, rollers, trenchers, pavers, mixers or compressors, for handling cement, sand, gravel, stone, lumber, steel, pipe and other materials, made in 2-, 4-, 6-, and 8-wheel types and in 1/2- to 50-ton capacities, are described in the bulletin of the Highway Trailer Co., 508 Fulton St., Edgerton, Wis.

PORTABLE AND STATIONARY TAR HEATERS

The catalog of the Jos. Honhorst Co., 1016 W. 6th St., Cincinnati, Ohio, describing tar heaters of from 50 to 200 gallons capacity both portable and stationary, which can be furnished with rubber-tired wheels, may be secured upon request.

STEEL ROAD AND BUILDING FORMS

The Hotchkiss Steel Products Co., Binghamton, N. Y., will be pleased to send on request its pamphlets describing EZ steel road forms and steel building forms made in all sizes for the construction of concrete roads, walks, curbs and gutters, drives, building foundations, etc.

BOILERS FOR CONTRACTORS' EQUIPMENT

If you have a boiler problem to be solved, write for information to Johnston Bros., Inc., Ferrysburg, Mich., who specialize in all types of boilers for contractors' equipment.

MIXERS WITH PLENTY OF POWER

Kiel Master mixers which have dust-proof counter-drive shaft bearings, a drum spindle bearing 10 inches long, balanced drum and yoke, special mixing blades, plenty of power and positive gear drive, are described in a catalog and price list which may be secured upon request from the Kiel Machine Co., Kiel, Wis.

HOISTING BLOCKS

Star Brand hoisting blocks which are always reliable and made for every condition of service are manufactured by the Boston & Lockport Block Co., East Boston, Mass., from whom information and prices may be secured.

ROLLERS OF ALL TYPES AND SIZES

Catalog A, issued by the Buffalo-Springfield Roller Co., Springfield, Ohio, contains complete information regarding the full line of Buffalo-Springfield rollers made in all types and sizes and with or without scarifier attachment.

RELIABLE AIR-COMPRESSORS

The Buhl Co., 405 S. Dearborn St., Chicago, Ill., manufacturers of Buhl air-compressors which are made in a variety of types and sizes to meet every portable compressor demand, will gladly send bulletins describing its compressors to interested contractors.



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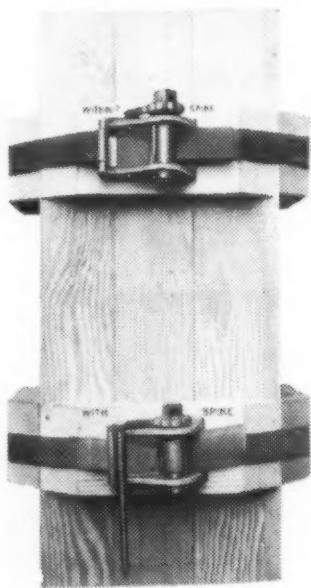
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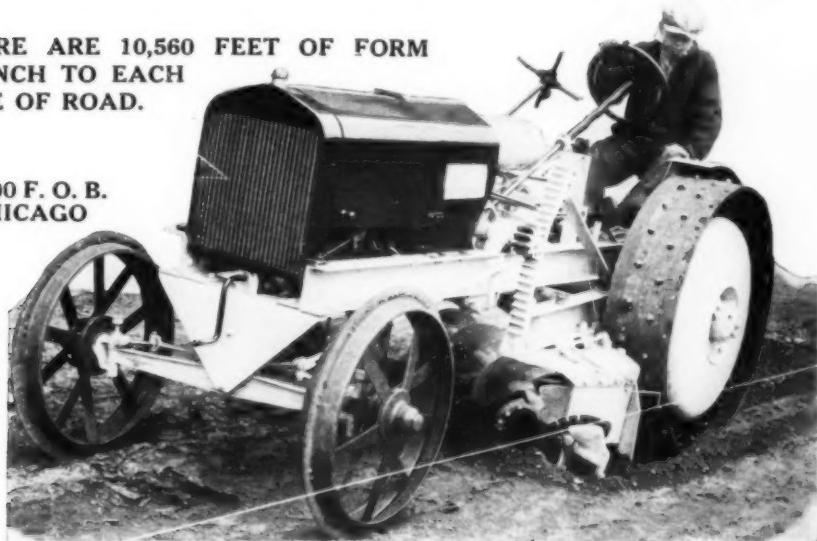
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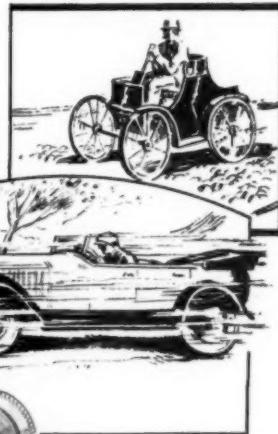
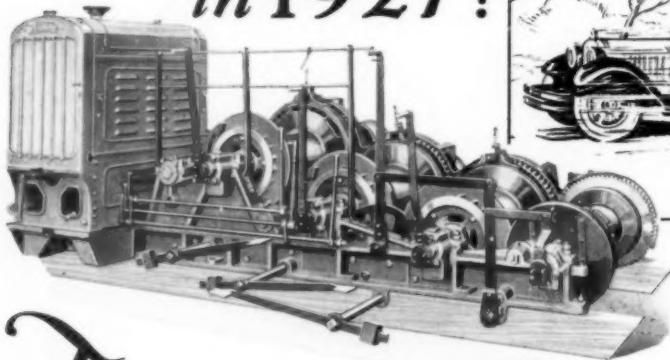
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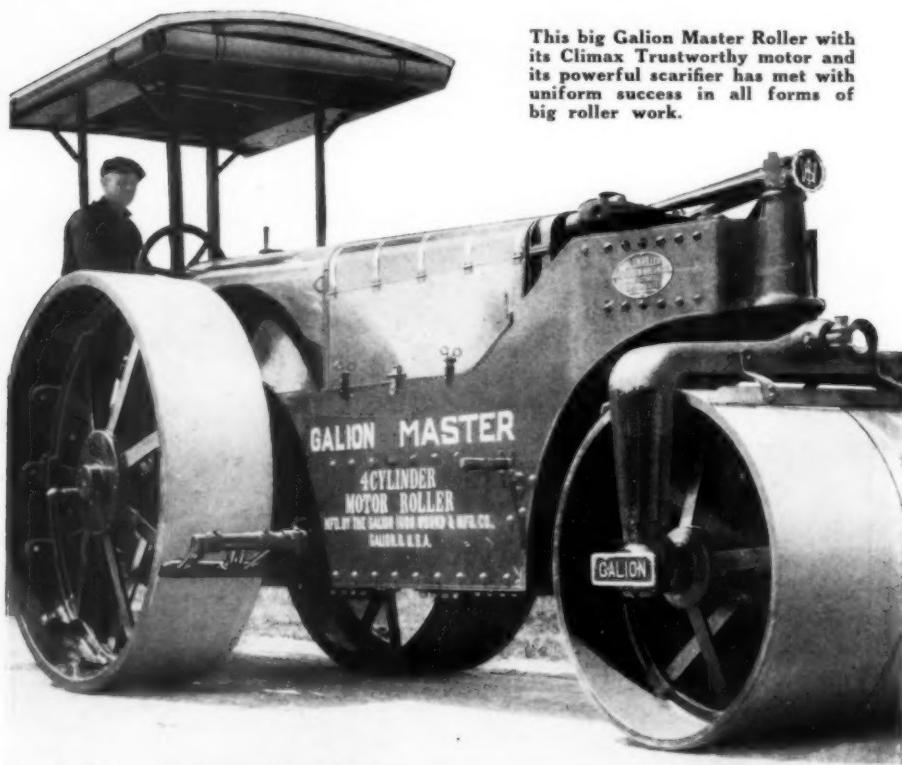
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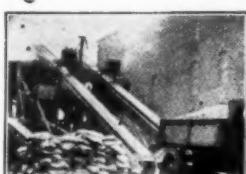
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Northern King
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Capacity 75 to 160 tons per hour. All lengths up to 100-ft. — 24-in. belt width. Gas Engine or Electric Motor Power.



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Capacity 60 tons per hour. All lengths from 16- to 50-ft. — 16-inch belt width. Gas Engine or Electric Motor Power.



Low Price---General Utility

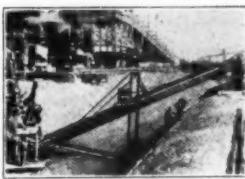
Northern Model B16
22-ft. length — 16-inch belt width. Capacity 40 to 55 tons per hour. 3-phase electric power. Complete, f. o. b. Janesville, \$437.00.

NORTHERN Conveyors are available in sizes and types to fit every material handling purpose. Capacities range from 35 to 160 tons of loose material per hour. Because of their extremely rigid "Built Better" construction, Northern Conveyors can be had in all lengths up to 100 ft. and in six separate belt widths. Whether it's handling sand, gravel, stone, concrete, crushed rock, brick, coal, ashes, mortar, lime, earth, packages or units—anything and everything in loose and semi-loose material you can find a standard Northern to fit the job. And when it's material handling requiring radically special equipment a Northern can be built for the job,—quickly and economically.

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Janesville, Wisconsin

*Belt Scraper and Stationary Conveyors,
Portable Steel Hoppers, Bag Cleaners*



Northern
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CONVEYORS

NORTHERN CONVEYOR & MFG. CO. Janesville, Wisconsin Send catalog on Northern Conveyors.	
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"At every curve... we install this



*Mr. Knox T. Thomas,
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Thomas' thorough
knowledge of con-
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work has brought
him merited recogni-
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South.*

"WE specify expansion joints in all our concrete construction," said Knox T. Thomas, prominent Consulting Engineer at Atlanta, Ga. "Just look over these photographs and note how well the joints have preserved our concrete.

"We've found that it pays to provide special protection at all curves or breaks in the street or sidewalk. At every driveway, for example, we extend an extra joint around the circle, along the outer edge of the curb. This supplements our longitudinal

every intersection, extra protection"

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Carey Elastite Expansion Joint has been used extensively in Atlanta, as well as in hundreds of other cities throughout the United States. Mr. Thomas is but one of the country's leading engineers who recognize in it an ideal means of guarding against overstresses in concrete pavements. Our 72-page booklet will tell you all about Carey Elastite Expansion Joint—how to install it and how effectively it will protect concrete construction work. Write today for a copy. It's free.

THE PHILIP CAREY COMPANY
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Elastite**
THESE HELD US ALIVE
**EXPANSION
JOINT**



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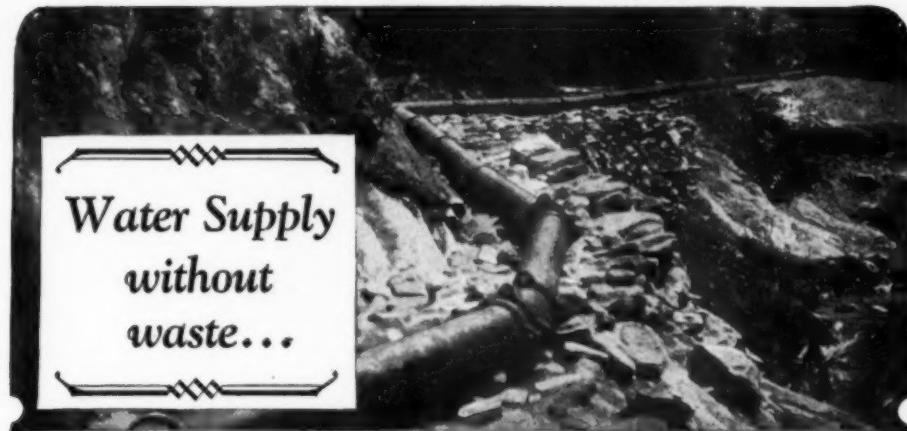
No bell holes to dig. No joints to make.

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without
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Before pipe is laid... and after..



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Every joint as tight as the wall of the pipe itself.

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Put your water supply, fire protection and sewage disposal problems up to our nearest office.

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3. You save buying and handling lead, lead substitutes and all other joint-making materials.
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6. You are safeguarded against costly repairs and replacements because there is nothing to deteriorate, nothing in the joints to work loose.
7. You are protected against the risk and the inconvenience of leakage.
8. You are assured of water supply and fire protection *without waste*.

UNIVERSAL CAST IRON PIPE

No bell holes to dig: No joints to calk

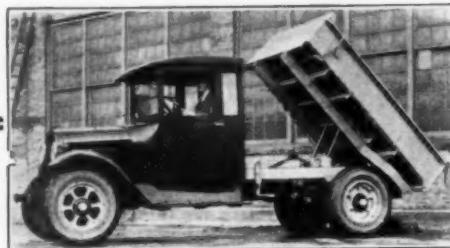
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You'll Like this HEIL-GRAHAM Dump



Here's a Heil-Graham Light-Duty Dumping Unit. It includes a Heil 2-yd. body and Heil No. 3 twin-cylinder hoist mounted on a 2-ton Graham Bros. truck. Notice the dumping angle—it's big enough to permit the operator to dump any load quickly and without difficulty. When the body is lowered, you will appreciate the low mounting height which makes it easy for hand-loading. Heil makes bodies and hoists to meet every requirement and for every make and model of motor truck. Write for the Heil Demograph Bulletin. There is no substitute for Heil Quality.

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Caterpillar Two-Ton Tractor For Power

For highest efficiency and lowest work-cost, the No. 4 is an added achievement—a machine of more power and heavier construction. Does with ease the heavy efficient on loose or sandy soil where wheel-type tractors balk or slip.

Russell Motor Patrols are built in four sizes—

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- No. 3 for 10-20 McCormick-Deering tractor for power
- No. 4 for "Caterpillar" 2-ton tractor for power
- No. 5 for "Cletrac" 20-K tractor for power

Each of the four models—No. 2—No. 3—No. 4—No. 5—is equipped with scraper—worked with blade or independent of blade, as desired.

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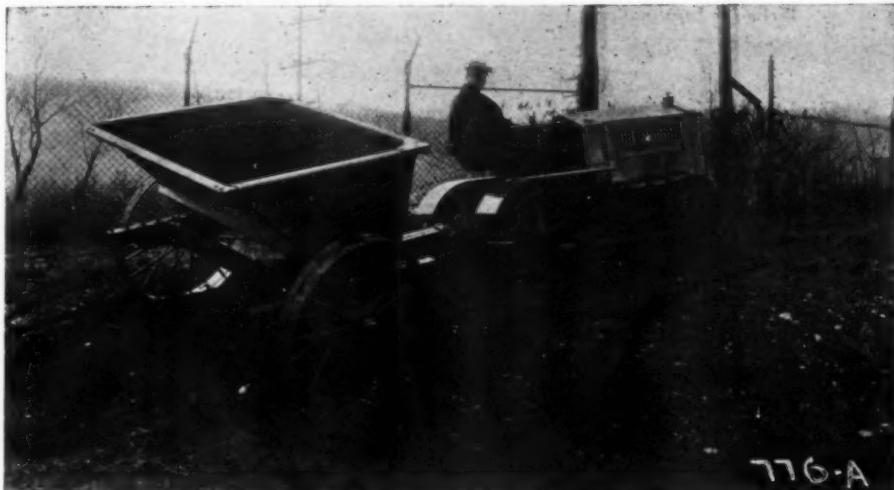
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Rogers Gooseneck six-wheel trailer.

Also two-, four-, and eight-wheel types for all construction requirements.

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"SUMMARY"

1	Ton special, Ford	Model "F"	power unit,	400 Lbs. draw bar
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6	"	Model "IBV"	McCormick-Deering	2400 Lbs. "
			Furnished all gauges—All high speed units—	
			Ford driven two or four speeds, both forward and reverse.	
			Fordson and International, three speeds both forward and reverse—Without alteration of Tractor power units which are employed intact, other than discarding wheels and front axle assembly.	
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9	"	Model "IBX"	McCormick-Deering	3600 Lbs. "
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			Three speeds forward—Three speeds reverse.	
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CLEANS DITCHES
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While the Telescopic Axle is indispensable on work such as that



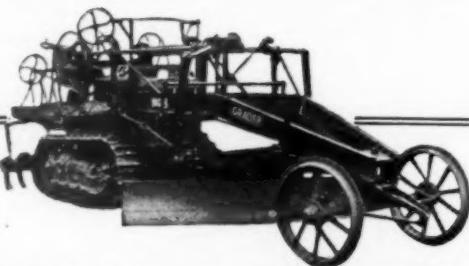
illustrated in the picture, its greatest value lies in the ordinary every-day work required of a grader.

A special catalog tells why this feature practically doubles the capacity and efficiency of one of these machines.

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SPEARWELL "BIG 8" GRADER-MAINTAINER
Equipped with Road Wheels for high-speed maintenance or Crawler Treads for heavy-duty grading—furnished for the following Tractors—

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JOHN DEERE and FORDSON**

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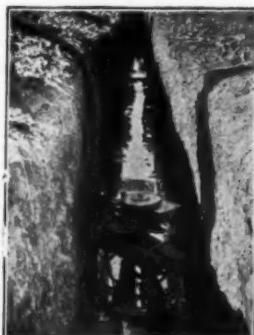


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- (1) Automatic Stop
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Head Gal. in per R.P.M. feet hour		
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5	6575	865
10	6150	895
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20	5000	950
25	4175	980
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*Let us send you samples,
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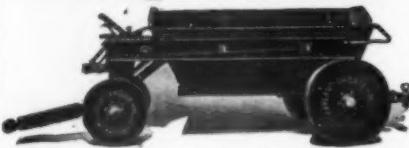
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LaPLANT-CHOATE All-Steel Tractor Dump Trailers



3-Yard and 6-Yard Capacities

Big Capacity—Short Turning Radius—Wide-Tired Wheels—All Steel Construction—Positive Dumping Mechanism—Disc Steel Wheels—Roller Bearings—Full Circle Swing—3-Point Oscillating Frame—Low Center of Gravity—Swivel Toggle Spring Draw-Bar Coupler.

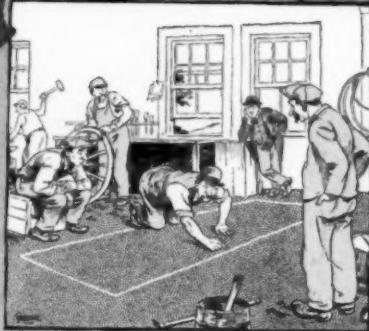
LaPlant-Choate All-Steel Tractor Dump Wagons have been manufactured over a long period of years. Long experience, modern production facilities, broad knowledge of hauling requirements, and engineering skill form the background of LaPlant-Choate Tractor Dump Wagons. An investment in these wagons embodies every element of safety, efficiency, and economy. In brief, LaPlant-Choate Dump Wagons represent exactly that type of product which you would naturally expect from a large, experienced and progressive manufacturer.



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Mack BACK IN 1900



Naturally the Floor's the Place
for Drafts - - - - -

THE incident pictured and described is the scene of a meeting held upon the floor of operations in the original MACK shop at Brooklyn, N.Y., 27 years ago.

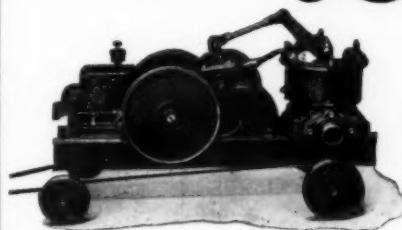
THE first experimental and research department of the Mack Company consisted of a room in the home of the Consulting Engineer. Here the little group were permitted to meet, providing they wiped their feet and used the ashtrays.

When in the shop, instead of developing designs on the drawing board, Mr. Mack would mark out on the floor the width and length of the proposed frame (using of course the known horse-drawn vehicle standards) and then the draftsman would lay out the cross members and other chassis parts. When the frame, motor transmission and rear and front axles were ready, the frame was placed on wood horses, the motor and all other parts were blocked up in their relative positions and the pattern maker was called in. It was his puzzle to design and produce the necessary brackets and supports so that the component parts could be properly assembled as a bus chassis.

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INTERNATIONAL MOTORS COMPANY
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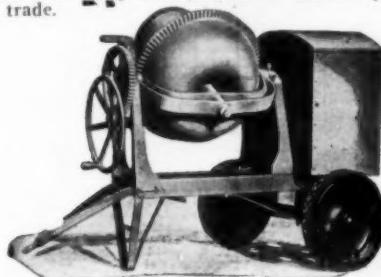
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THE JOHN LAUSON MFG. CO., 11 Jackson St., New Holstein, Wis.

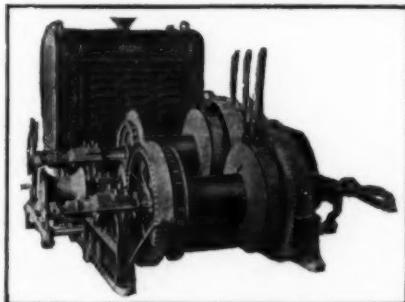
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Surprisingly Low Prices

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50 H.P. 2,400 POUNDS AT 400 FT. PER MIN.

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Kiesler Buckets give maximum service in digging or re-handling with low maintenance and operating expense.

They are the FASTEST CLOSING, FASTEST OPENING and FASTEST DISCHARGING Digging Clam-Shell Buckets. On account of their shape (found only in Kiesler Buckets) they get into the corners of the cars and require very little hand labor to clean out the material left in the car.

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The "Sparta" is designed to make fast work with least possible fuss. When considering drilling operations investigate "Sparta" thoroughly.

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when you purchase
ANVIL BRAND BLOCKS
For
MANILA OR WIRE ROPE.

We make all standard styles and sizes and can also supply any special blocks, if you will furnish specifications.

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Take any north-bound motor coach—fare 10c—or any surface car routed in North Clark Street.

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Reliable Labor Savers

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Let us demonstrate this superiority to you. Write us saying you would like to know more about them. We will gladly give you the whole story without obligation.

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Locomotive Department

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Several superior models adapted for carrying 6½-8-9-10-12 and 14 ft. blades.

Adaptable to all conditions and soils.



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More Miles Have Been Covered by the KINNEY Distributor than by any other heater and distributor in the world.

The KINNEY Heater and Distributor

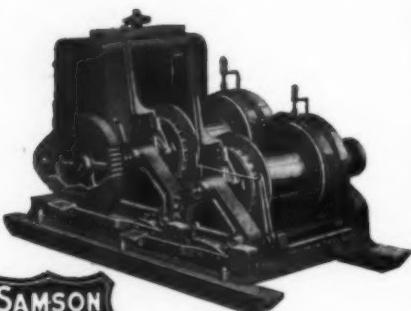
will properly heat and apply the heaviest asphalts and tars as well as the lighter grades of bituminous road material with equal efficiency and with the least expenditure of time, labor and money.

Equipped with the Kinney Positive Pressure Pump and the Kinney Spraying Nozzles and circulating and heating systems. Self-loading from tank cars.

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Iron Works Dept. Established 1880
Manufacturers KANSAS CITY, Missouri, U. S. A.

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Does not "set" or harden. Makes absolutely tight joints. Joints may be easily opened at any time. Saves time, fittings and tools.

Recommended for all threaded or faced joints of steam, water, gas, oil and air piping. It resists heat, cold, acids and alkalies and protects joints from corrosion.

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Jersey City  New Jersey
1827 — One Hundredth Anniversary — 1927

Marion Dump Body

Length: 72 inches. Width: 45 inches. Sides: 18 inches. Front and end gate: 34 inches. CAPACITY: 34 cubic feet



Here it is—the real producer that never balks. It's durable and dependable. Marion bodies can be used with hand hoist or as an automatic type. This is a most satisfactory Dump

Body for handling stone, gravel, sand, dirt, coal and other loose material. Always ready for the hardest kind of service. The Marion is the favorite of leading Highway Contractors. It is the dump body of exclusive features.



Showing Marion Body equipped with automatic sub-frame.

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BAR TIES**



Tying Concrete Reinforcing Bars with Wire Tie
and Tying Tool

ASK YOUR DEALER

Will save you time, labor and dollars.

No skilled labor required to use this equipment.

Two or three turns with tying tool and bars are tied.

Ideal to use in cold weather—men do not have to take off their gloves

Manufactured by

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Schaefer Automatic One Man Tractor Scraper
AN EARTH MOVING TOOL ON THE MARKET SINCE 1921
All Operations by Tractor Power Control from seat while Tractor is in motion

**FOUR
IN ONE**

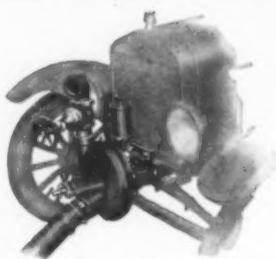
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— all done by this easily handled one-man Tractor Scraper.

Write for Circular 5-26-269.

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BARTON Portable Pump



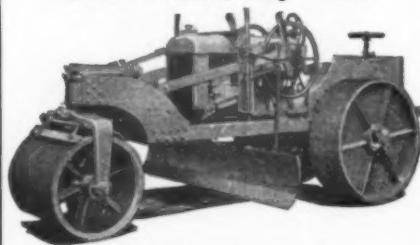
**50 to 900 Gallons per Minute—
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A NEW large capacity, low priced pump for drainage and water supply. Thousands now used by cities, utility companies and contractors. Special Automatic Primer exclusive feature. Easily installed. Sturdy and fool-proof. The Barton will cut your pumping costs to the bone.

Write for Bulletin 58

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BATTLE CREEK MICHIGAN**

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Frankfort, New York**

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Does Four Men's Work

When surfacing and finishing any type of concrete construction one man with a Berg can do the work of four rubbing by hand. Think of the time, money and labor saved and the increased production effected by the use of this most highly efficient tool! It's worth investigating—complete details will be mailed upon request.

The Concrete Surfacing Machinery Co.

4669-71 Spring Grove Avenue

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CINCINNATI, OHIO

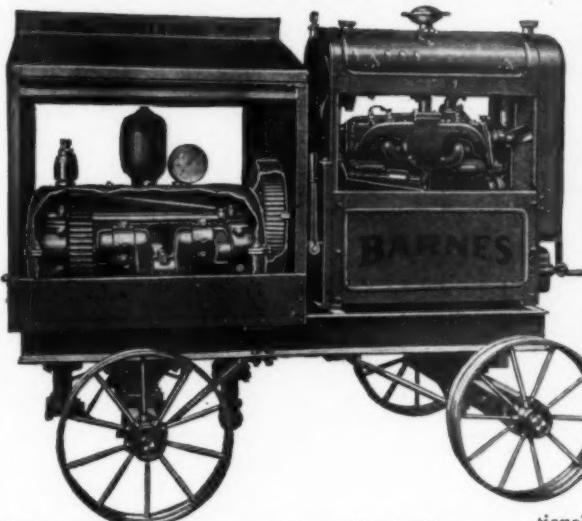
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New Road Pump Bulletins Are Now Ready—Write for Your Copy

The BARNES Manufacturing Co.,

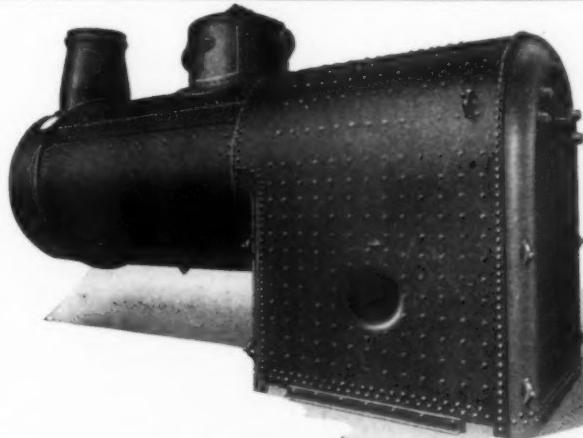
BARNES POSITIVE OILING ROAD PUMPS

80 to 150 Gal. per Min.
Pressures up to 500 lbs.

POSITIVE Lubrication insures long life for gears, bearings and other working parts of the pump. The crank case protects all moving parts from dust and grit.

Crankshaft and jackshaft run in Bronze-Backed Shell Bearings which are adjustable as well as replaceable. These exceptional features in the 1927 Barnes Road Pumps insure dependable performance.

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Specializing in Boilers for Contractors' Equipment
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Dealers Everywhere

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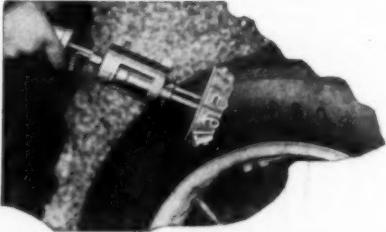
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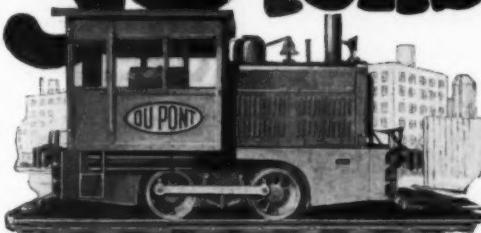
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a 30-ton
"WHITCOMB"**

Whitcomb, builders of the first successful gasoline locomotive, now build the largest, to meet the haulage needs of the Dupont Rayon Company, at their Buffalo, New York, Plant.

More horsepower per ton of weight, a Whitcomb characteristic, is fully developed in this 30-ton giant that will outrun any locomotive of similar rating. Powered with a 6-cylinder, $6\frac{1}{2} \times 7$ engine, capable of developing 160 horsepower at 1,000 R.P.M., it has a draw-bar pull of 17,500 pounds on low gear without sand. A 30-ton "Whitcomb" is ideal for heavy duty, industrial haulage jobs on inter-plant transportation, contract work, pit work, yard switching, or where heavy loads must be moved quickly and economically.

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What a TRAYLOR Compressor will do—

12 in. x 10 in.
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NOW IN
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1. Will run five (5) pneumatic drills.
2. Will run fourteen (14) chipping hammers and keep the gang busy.
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Their full-ball-bearing-throughout; their efficient water pump; and their large receiver capacity make these double-acting, slow speed compressors unbeatable.

For Rock Drilling and "Cement-Gun" Work

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Cuts 4 inch Lumber - Weighs only 24 lbs Stands Up Under Heavy Work



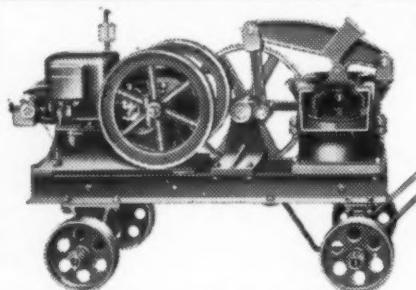
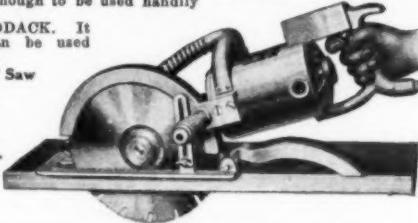
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1½- to 30-Horsepower

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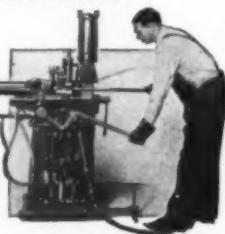
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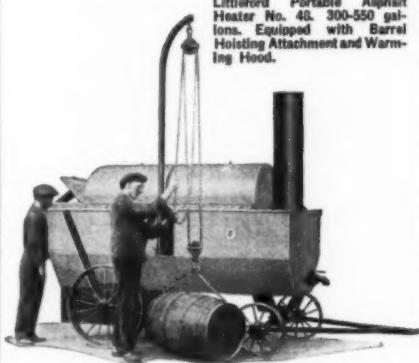
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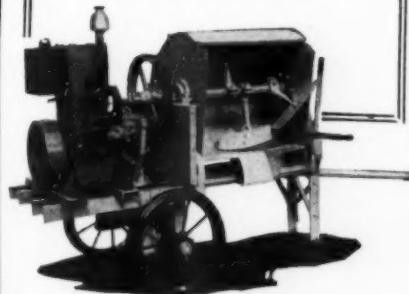
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Every description of fabricated steel

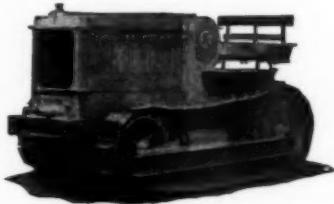
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Air! More Air! You'll get a steady, reliable supply all day long if an O. K. Compressor supplies your tools. O. K. Compressors are oversize. They deliver. Three sizes—120, 160 and 265 cubic feet per minute. Equipped with special clutch between engine and compressor for easy starting. Many other improved features. Built by the makers of O. K. Hoists.

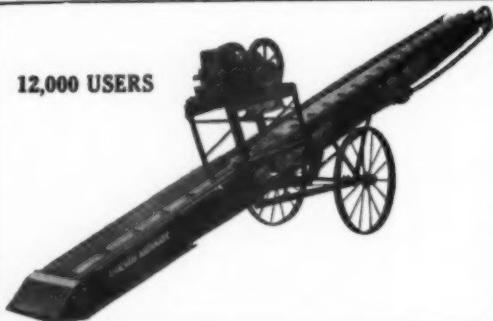
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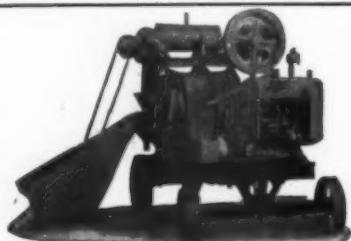
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 WITH THE
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 FOR
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Originators of the Portable Conveyor
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120 to 150 Cu. Yds. in 10 hours with an Atlas one bag Mixer.

Atlas Mixers are of sturdy dependable construction, and the 7-S is regularly equipped with multiple cylinder LeRoi Engine, giving excess power.

We build 3½ ft., ½ bag, 1 bag and 2 bag Mixers.

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Low day-in-and-day-out operating costs distinguish the performance of Bates Tractors.

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3 SIZES

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A hoist for every make, model and capacity of motor truck.
Sold and serviced everywhere.

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WHEN you buy Wood Equipment it becomes your property, but ours is the responsibility for satisfactory performance--until the last load is dumped.

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Wood Hydraulic Hoist & Body Company
World's Largest Builder of Dumping Equipment
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EASY TO HANDLE

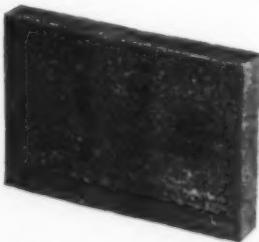
*From Factory to
Final Installation*

SEALTIGHT

THE PERFECTED JOINT

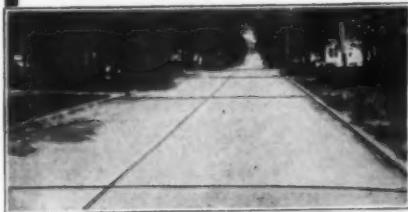
is as easy to handle as planking—regardless of weather conditions. It leaves the factory packed in convenient sized boxes—and reaches you in that condition. Does not distort or bend out of shape in hot weather—nor shatter in winter. Sealtight is reinforced throughout, not merely on the sides.

Sealtight is a mixture of pure blown petroleum asphalt and a long flexible vegetable fibre filler—which upon oozing seals the joint perfectly.



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Road
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"Sealtight"*

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OR DUMPS CONTINUOUSLY**
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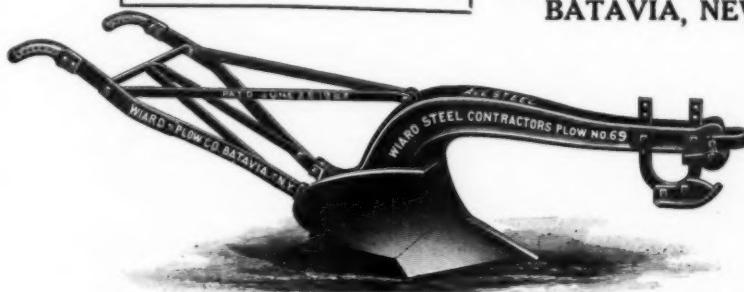
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With or without Scarifier attachment.
Helps you finish the job on time.



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PORTA-HOIST
CUTS YOUR COSTS



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SIZES



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HVATT
ROLLER
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THE FINEST MONEY CAN BUY

Hyatt roller bearings throughout, roller-drive chain, Dot high-pressure lubrication, malleable wheels, divided type mixing blades, automatic return—everything provided to make it the fastest, easiest operated, most durable mixer built.

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Dealers carry complete stocks for quick delivery.

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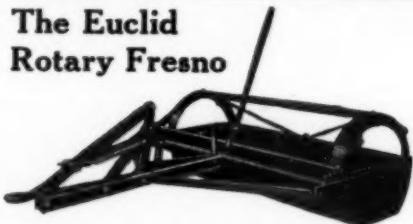
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Outstanding Euclid Features:

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An extra deep bowl with a high draw-bar clearance gives the Euclid more than the ordinary Fresno capacity.

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Ask for the new earth-moving equipment folder which gives all information on the complete Euclid line.

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Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912, of The Contractors' & Engineers' Monthly, Published Monthly at New York, N. Y., April 1, 1927.

State of New York, County of New York, S.S.

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared EDGAR J. BUTTENHEIM who, having been duly sworn according to law, deposes and says that he is the President of the BUTTENHEIM-DIX PUB. CORP., Publishers of THE CONTRACTORS' AND ENGINEERS' MONTHLY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the year shown in the above caption, rendered by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

PUBLISHER: BUTTENHEIM-DIX PUB. CORP., 443 4th Ave., N. Y. C.
Editor: THEO. R. KENDALL
Managing Editor: None
Business Manager: THEO. R. KENDALL.

2. That the owners are: (Give names and addresses of individual owners, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, as they appear upon the books of the company but also, in case where the stockholders or security holders appear upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as such, hold their stock, bonds, or other securities, other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

BUTTENHEIM-DIX PUB. CORP.
EDGAR J. BUTTENHEIM, President

Swearn to and subscribed before me
this 31st day of March, 1927.
New York County Clerk's No. 385.
My commission expires May 30 1929.

H. RADITZ
Notary Public

Kings County N. Y.



A
USEFUL
PIECE
OF
EQUIPMENT

You probably have your share of those odd lifting and handling jobs that are such a severe tax on the strength and patience of your men.

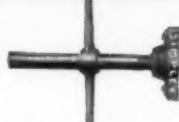
A W&K One-Ton Fordson Crane is a good solution.

Made in two sizes with 7- and 12-foot lift. Write for illustrated booklet.

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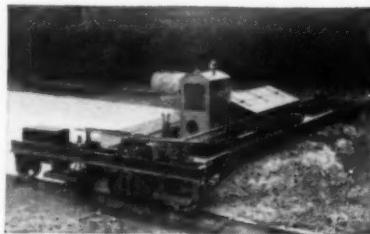


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Templeton, Kenly & Co., Ltd.
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Mfrs. of the Quality Simplex Lifting Jacks

The ORD Concrete Road Finisher
Leaves No Bubbles in the Road



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Where can we Buy it

If there is any particular type of machinery or equipment on which you would like to receive price lists or catalogs, in connection with your contracting work, please fill in the form below and we will be glad without charge or obligation to bring the matter to the attention of the manufacturers best fitted to quote you or supply you with the desired information



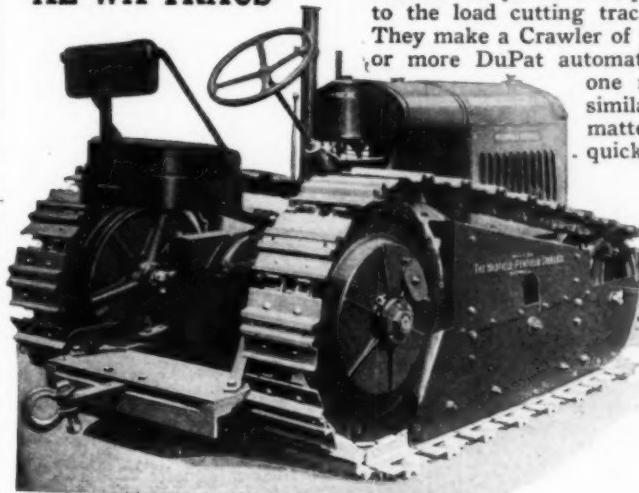
Contractors' & Engineers' Monthly
443 Fourth Ave., New York City

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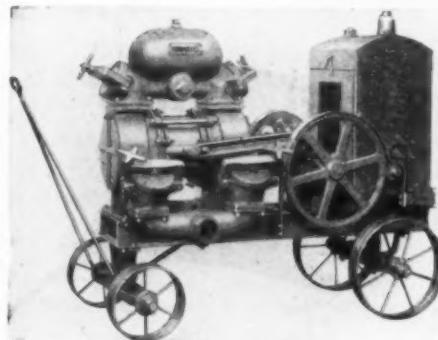
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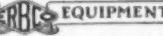
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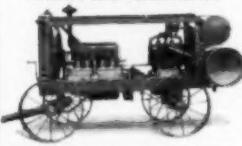
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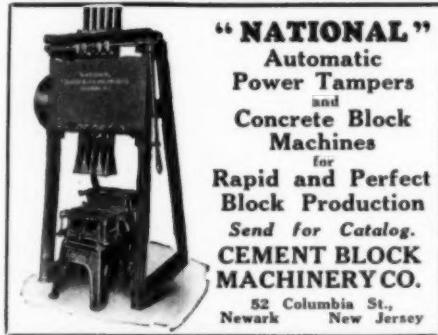
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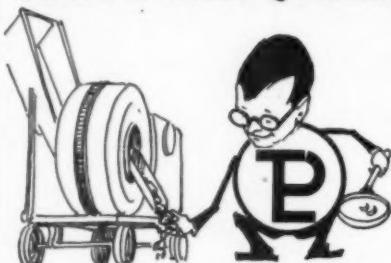


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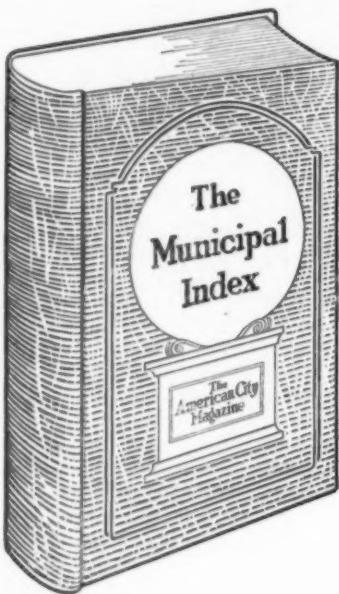
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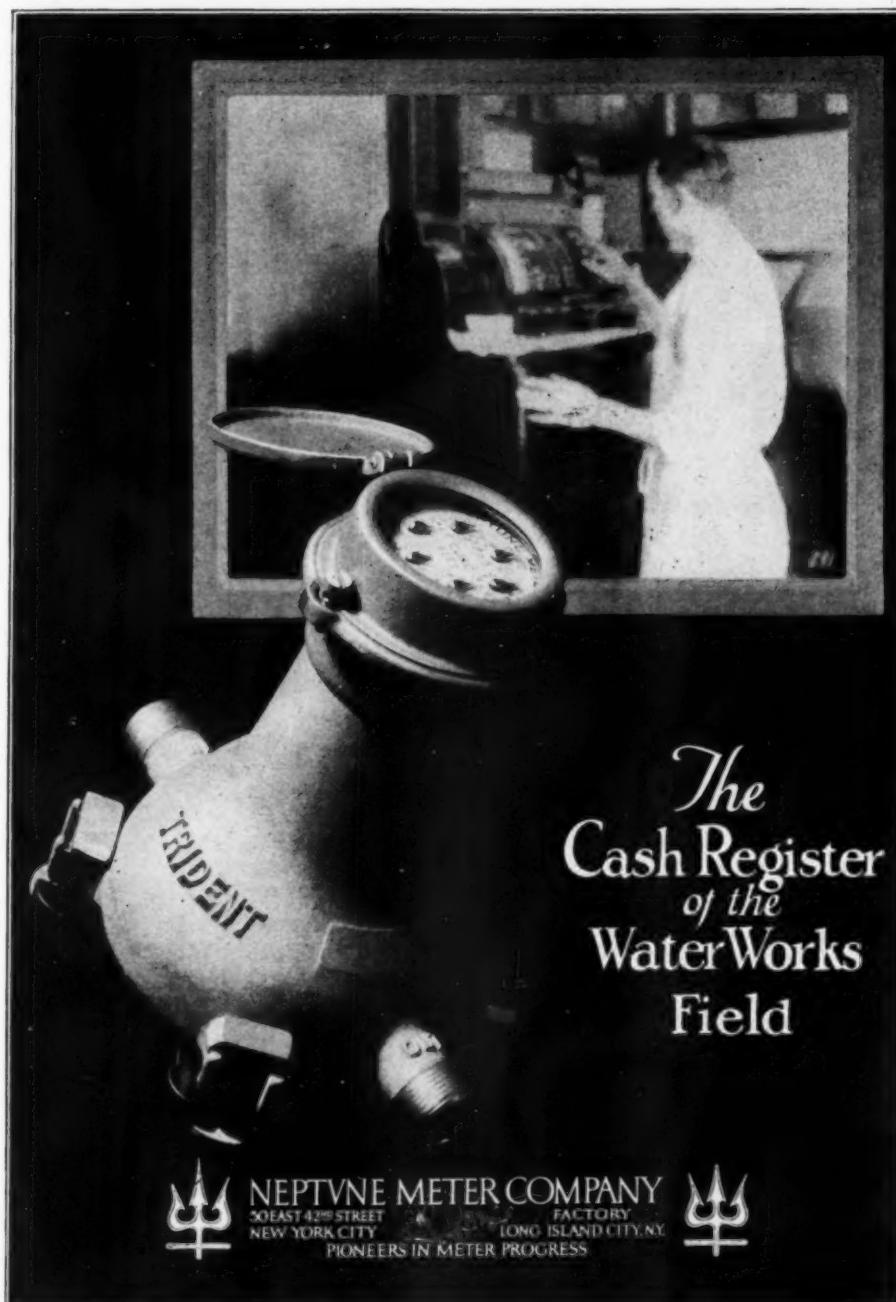
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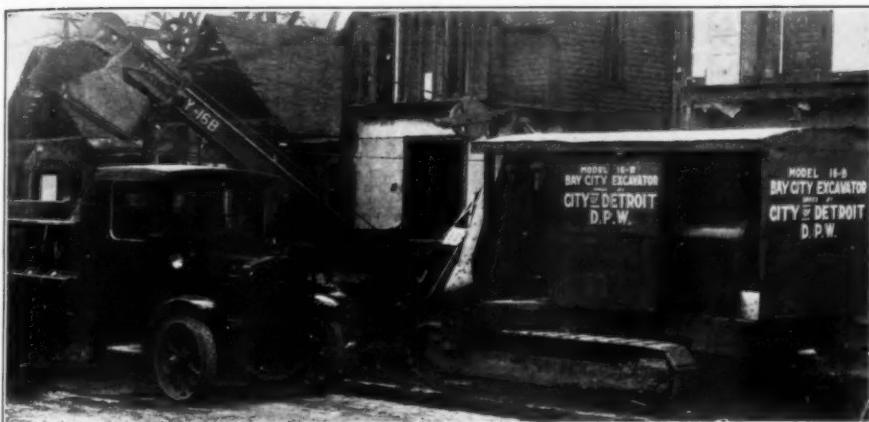
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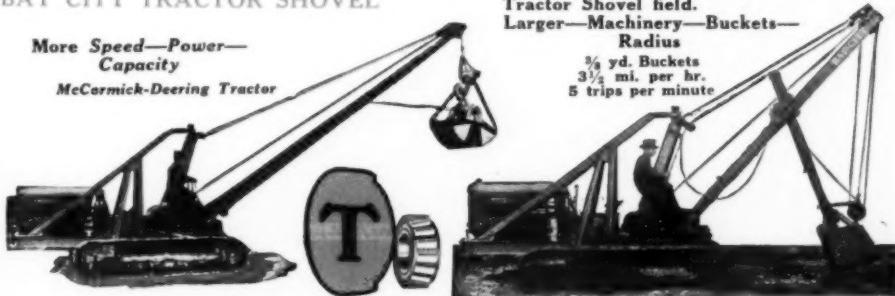
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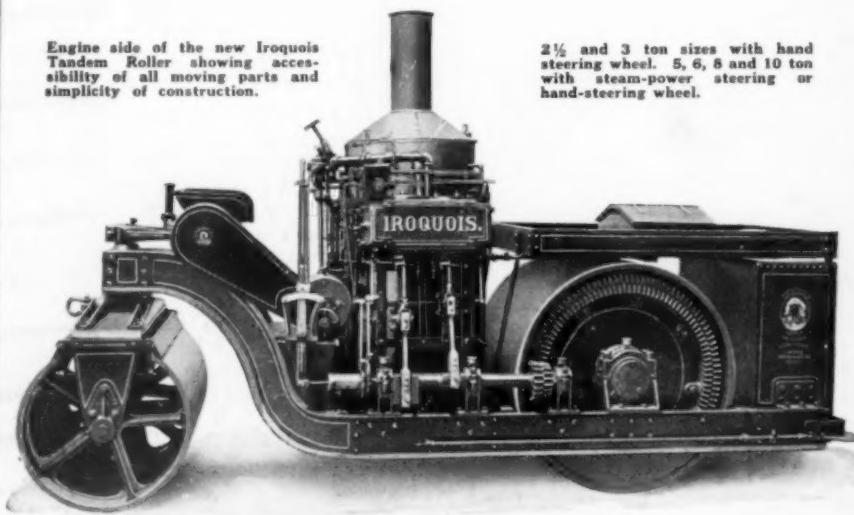
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